



Washington
Department of
**FISH and
WILDLIFE**

Drought Status Update #19

July 17, 2015

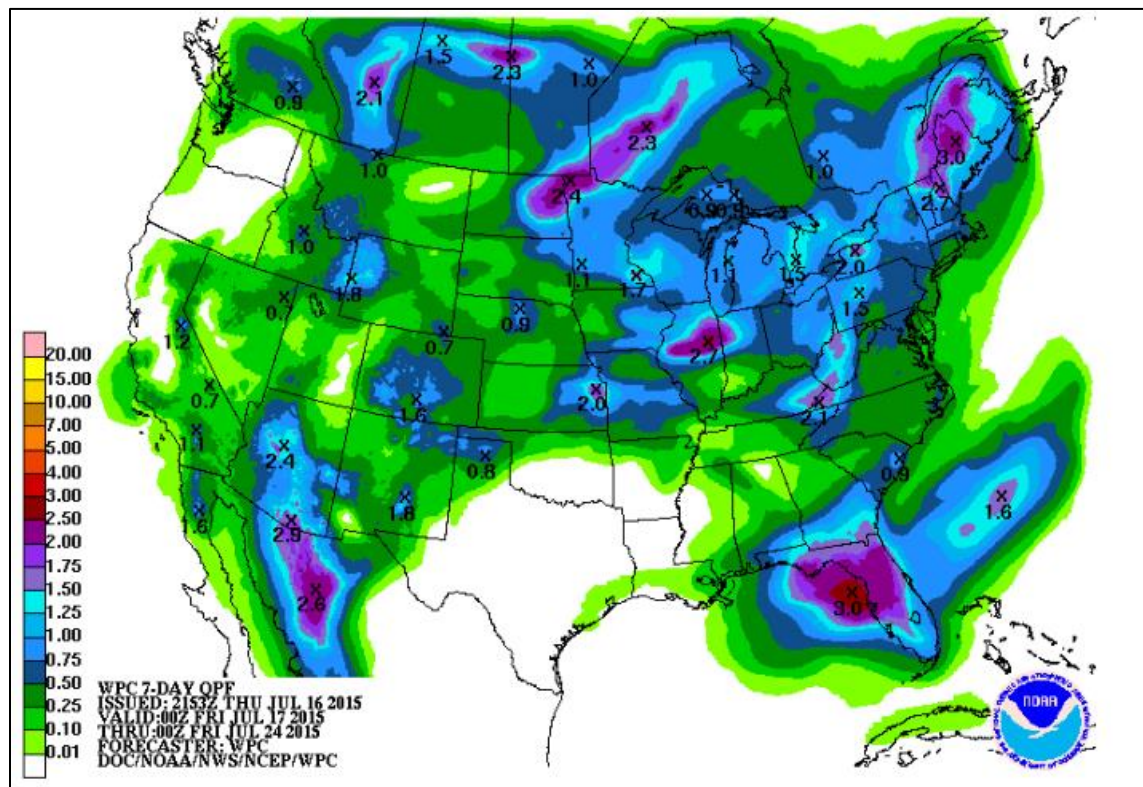
Note: This material is intended for, and contains elements of special interest to, WDFW agency staff. Non-agency readers or anyone having questions about the context, clarity, or content for items in this update should contact the author, WDFW Drought Coordinator Teresa Scott at (360) 902-2713 teresa.scott@dfw.wa.gov

First a reminder to check out the [weekly update by the Office of the State Climatologist](#), which eloquently summarizes conditions and climate milestones to-date. One of this week's features is the [video report](#) from The Columbian in Clark County starring WDFW's own Jim Byrne. Great job, Jim! Indeed, as attention shifts from the statewide response to local impacts, more and more regional staff will be taking starring roles in media coverage. My thanks to all of you!

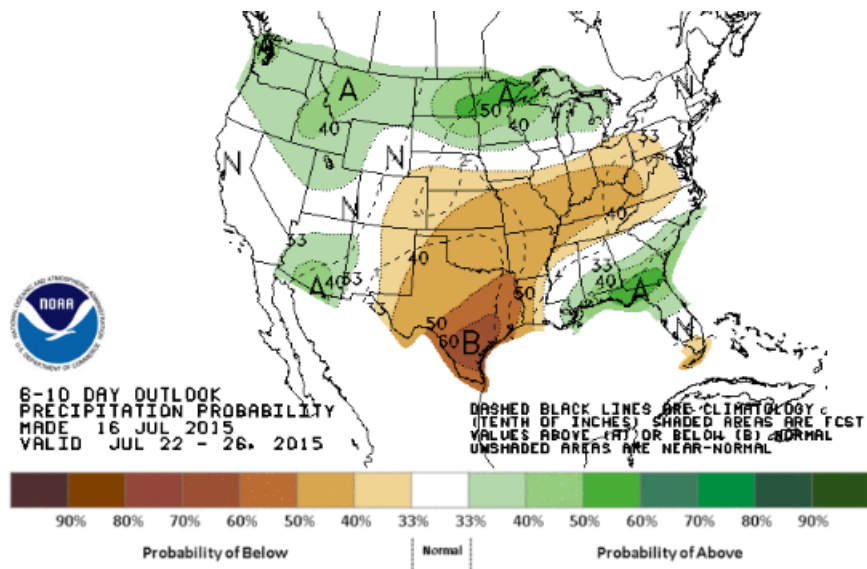
Have you heard the one about the Pessimist and the Optimist? The Pessimist says "Gee, things really can't get any worse than this!" and the Optimist says "Oh yes they can!" Washington welcomed our cooler weather last week, and some rain, too. But as a pessimist, I fear the overall trend is "worse." Read on for material both supporting and refuting my "pessimist" outlook.

Temperature and Precipitation Forecasts

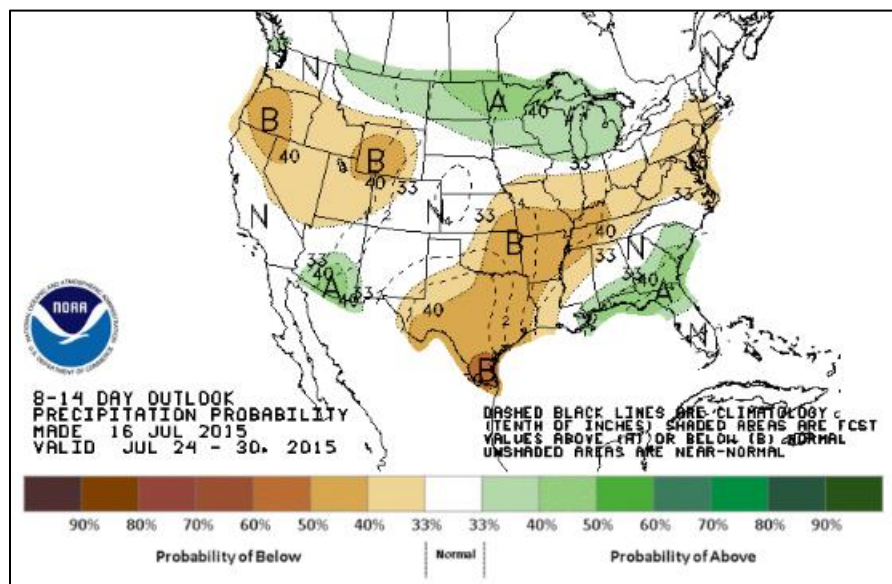
Precipitation is expected in northern and coastal Washington during the next seven days ([below](#)).



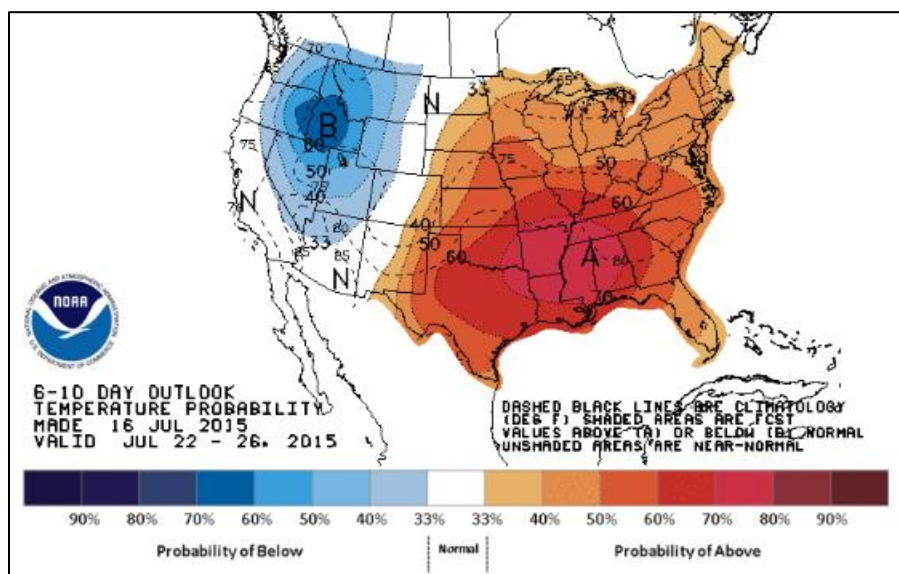
The 6-to-10 day probability of precipitation is greater than normal throughout Washington (below). I will be asking NOAA about the differences in what the above chart (precipitation in inches) is telling us versus the two charts below (probability for above/below normal).



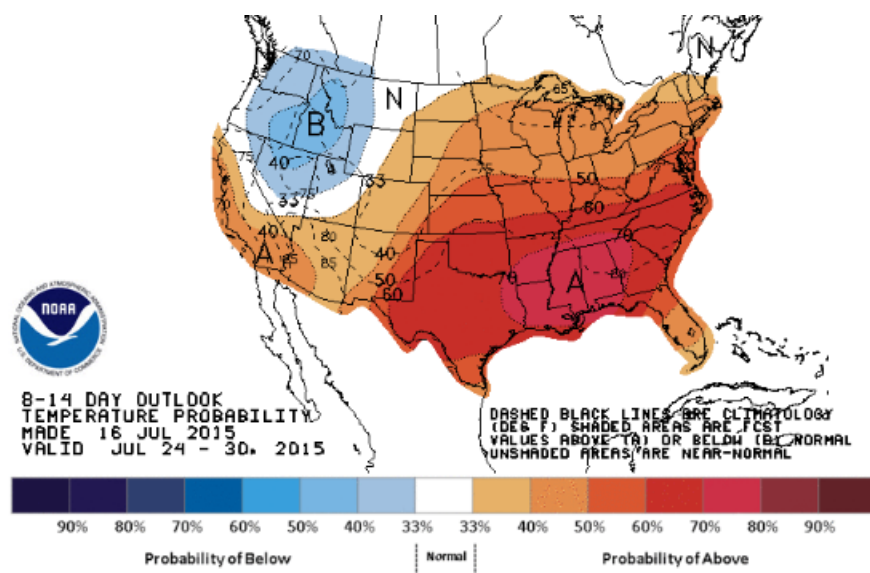
And below is the 8-to-14-day outlook (precipitation probability). This shows normal precipitation through most of Washington, with a chance of below-normal precipitation across the southern portion of the state.



The temperature outlook (below) is for BELOW-normal temperatures in the Cascades and eastern Washington for the next 6-to-10 days; “normal” in Puget Sound lowlands and the coast.



The 8-to-14 day period (below) is similar to the nearer-term, but less so. I like the look of the green swaths (higher-than-normal rain) and blue splotches (lower-than-normal temperatures), which, combined, could give fish a bit of relief in stream temperatures across Washington. It's interesting to note that the center of the lower-temperature universe in North America seems to be in Idaho! Good thing that's upstream!

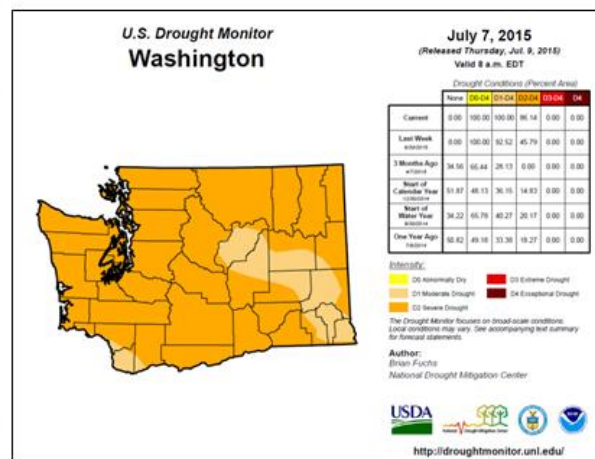
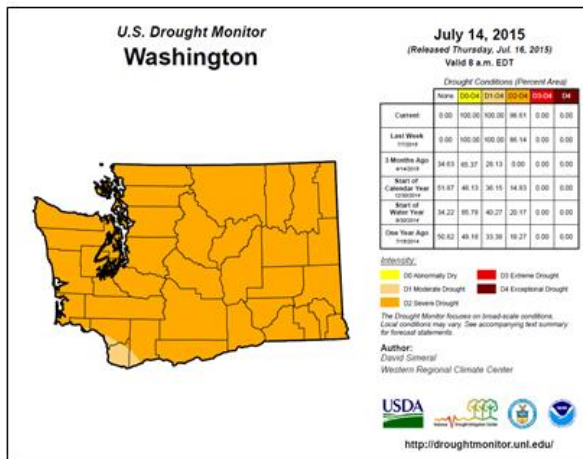


Federal Drought Status

One-hundred percent of the state falls under some sort of federal drought status, with most of the state under the "D2" Severe Drought classification. While these designations primarily relate to the agriculture industry, the high profile of this situation has captured national attention. The [U.S. Drought Portal](#) provides the weekly drought status for the nation (below).

This Week:

Last Week:



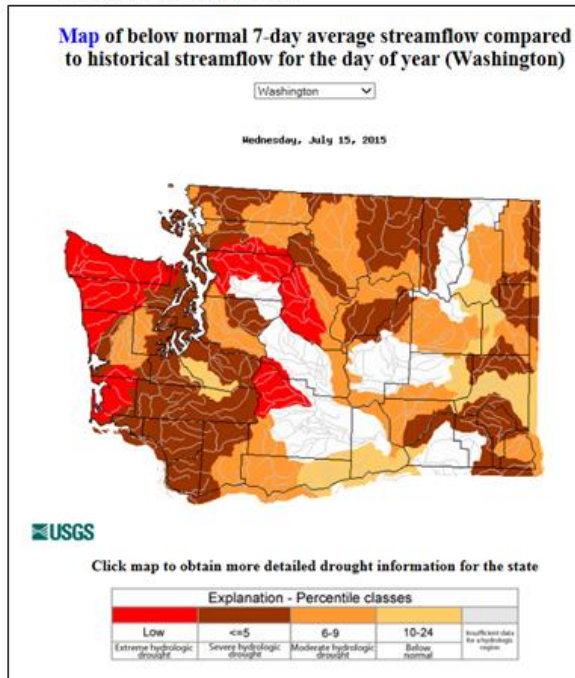
Area	Status	Federal designation
Northwest Olympic Coast	Week 4 at "Severe Drought"	In 4 weeks
South Central	Week 12 at "Severe Drought"	Asotin, Benton, Columbia, Garfield, Klickitat, Walla Walla Counties declared June 24 Chelan, Douglas, Grant, King, Pierce, Whitman, and Yakima counties declared July 1
Northeast	Week 9 at "Severe Drought"	[details next week]
Columbia Basin to Southeast Washington	Week 1 at "Severe Drought"	In 7 weeks
Southern Cowlitz, Clark & Skamania counties	"Moderate Drought"	

A federal drought designation is automatic for any county when D2 (severe drought) conditions exist for eight weeks in a row. A Secretarial disaster designation makes farm operators in designated counties eligible to be considered for certain assistance from the Farm Service Agency. Federal designation and all the associated activities are coordinated through [Washington Department of Agriculture](#); information distinguishing state-declared and federal drought designations, and the effect of federal designations, are available on the Ag web site.

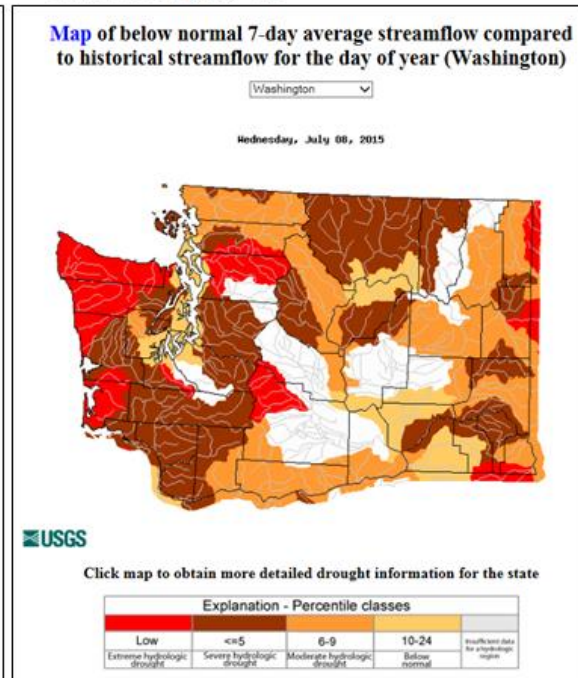
Stream Flows

For the state as a whole, the figure showing [stream gauges with below normal streamflow](#) for 7 days or more is similar to previous weeks. Some watersheds on the eastern edge of the state improved; Nooksack, Deschutes, Wenatchee and Chelan are degraded. The white areas are places with insufficient information.

This Week (July 15):



Last Week (July 8):



Hydrograph Sampler

Hydrograph Sampler Charts tell the stories pretty well - see the end of this document for charts and links to our favorite sites. One interpretation of these charts supports the Pessimist view that conditions won't get worse.

Selected Washington Streamflows Table

The table gives a quick visual reference for daily flows as a percent of normal for this date in the historic record. The first column shows the gauge location, the second column shows today's stream flow readings, the third column shows today's flows as a percentage of average flows for this date throughout the period of record, column four shows the (previous) minimum flow for this date, and the fifth column shows in what year that minimum occurred.

Only seventeen of our select set of 43 locations set record lows on July 16, 2015, so maybe the optimistic outlook mentioned at the beginning of this missive was a bit premature? Low flow records are occurring less frequently as we move into the traditional low-flow periods for Washington streams. [Statewide streamflows](#) are available from USGS.

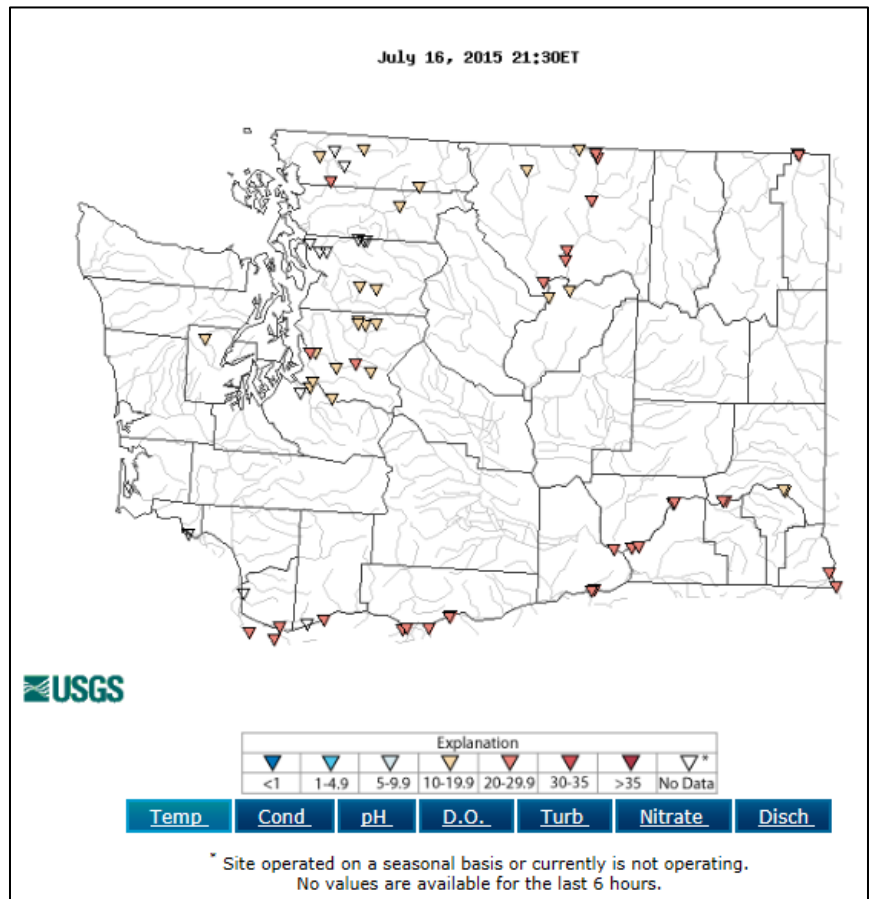
Selected Washington Streamflows for July 16, 2015				
	Today's Flow (cfs)	Percent of average for this date in the record	Min Flow (cfs)	Min Yr
MF NOOKSACK RIVER NEAR DEMING, WA	234	44%	183	1993
NOOKSACK RIVER AT FERNDAL, WA	1,380	37%	1,600	1977
SKAGIT RIVER NEAR CONCRETE, WA	9,390	45%	7,720	1977

SAUK RIVER AT DARRINGTON, WA	595	22%	645	1926
CASCADE RIVER AT MARBLEMOUNT, WA	581	30%	1,200	2006
NF STILLAGUAMISH RIVER NEAR ARLINGTON, WA	200	21%	275	1940
SNOQUALMIE RIVER NEAR CARNATION, WA	524	22%	760	1940
SKYKOMISH RIVER NEAR GOLD BAR, WA	363	10%	935	1992
ISSAQUAH CREEK NEAR MOUTH NEAR ISSAQUAH, WA	22	48%	19	2004
CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA	170	72%	94	1992
CEDAR RIVER AT RENTON, WA	202	70%	41	1958
BIG SOOS CREEK ABOVE HATCHERY NEAR AUBURN, WA	25	54%	25	2003
GREEN RIVER NEAR AUBURN, WA	258	46%	240	2003
SOUTH PRAIRIE CREEK AT SOUTH PRAIRIE, WA	49	46%	43	2003
PUYALLUP RIVER AT PUYALLUP, WA	1,570	47%	1,560	2001
NISQUALLY RIVER AT MCKENNA, WA	544	89%	30	1962
DESCHUTES RIVER NEAR RAINIER, WA	30	53%	30	2003
NF SKOKOMISH R BL STAIRCASE RPDS NR HOODSPORT, WA	45	13%	84	1926
DUNGENESS RIVER NEAR SEQUIM, WA	129	25%	182	1926
HOKO RIVER NEAR SEKIU, WA	14	16%	20	1967
CALAWAH RIVER NEAR FORKS, WA	59	28%	79	1995
HOH RIVER AT US HIGHWAY 101 NEAR FORKS, WA	538	30%	883	1992
SATSOP RIVER NEAR SATSOP, WA	231	49%	285	1944
CHEHALIS RIVER NEAR GRAND MOUND, WA	171	43%	160	1970
NASELLE RIVER NEAR NASELLE, WA	27	33%	29	1970
COWLITZ RIVER BELOW MAYFIELD DAM, WA	3,030	65%	1,540	1968
COWLITZ RIVER AT PACKWOOD, WA	453	24%	510	1992
LEWIS RIVER AT ARIEL, WA	1,260	63%	132	1931
WHITE SALMON RIVER NEAR UNDERWOOD, WA	549	61%	434	1944
KLICKITAT RIVER ABOVE WEST FORK NEAR GLENWOOD, WA	82	29%	88	1992
WALLA WALLA RIVER NEAR TOUCHET, WA	10	26%	3	1968
TUCANNON RIVER NEAR STARBUCK, WA	45	55%	31	1931
GRANDE RONDE RIVER AT TROY, OR	672	32%	490	1977
YAKIMA RIVER AT KIONA, WA	2,180			
AMERICAN RIVER NEAR NILE, WA	38	13%	65	1977
CRAB CREEK AT IRBY, WA	2	12%	1	1990
WENATCHEE RIVER AT PLAIN, WA	628	17%	790	1915
METHOW RIVER NEAR PATEROS, WA	605	29%	445	1977
OKANOGAN RIVER AT MALOTT, WA	1,090	27%	898	1977
OKANOGAN RIVER AT OROVILLE, WA	250	29%	110	2007
SPOKANE RIVER AT SPOKANE, WA	854	26%	715	1994
COLVILLE RIVER AT KETTLE FALLS, WA	46	29%	21	1977
PEND OREILLE RIVER BELOW BOX CANYON NEAR IONE, WA	10,800	38%	3,530	1977

Real-Time Water Temperature from USGS and Ecology

Water temperatures are increasing statewide. [USGS temperature stations in Washington](#) provides water temperature for stations having that feature (right). Temperatures above 20 degrees C are occurring at several locations across the state. Temperatures have moderated in western Washington this week, however Columbia and Snake River mainstem forebay temperatures have been exceeding 22 degrees C at most sites, a fact that plays out in our fish impacts reports this week.

Ecology's [Flow Monitoring Network](#) provides air and water temperature monitoring at several Ecology and co-op stations. There are a number of stations of interest, so follow the link and check it out.



Data for the Lake Washington Ship Canal can be found [here](#).

High water temperatures continue to contribute to fish die-offs across the region, with dramatic impacts along the mainstem Columbia River.

Reporting Temperature-related die-offs: For reporting purposes, die-offs with obvious natural (drought-related) causes can be reported through WDFW internal methods. But if there is no obvious natural cause (or the natural cause is obviously not drought-related), we need to be aware of the potential for hazardous material contamination and report such incidents through the Environmental Response Tracking System maintained by Ecology. The correct ERTS reporting mechanisms are identified on the [Ecology ERTS web page](#).

Drought Impacts to Fish and Wildlife

Water temperatures are a top concern for fish and wildlife workers and watchers this week this week. FERC-license-related activity is heavy as expected for this time of year as WDFW biologists support utilities in implementing their FERC licenses and/or operating agreements.

Stillaguamish

Stillaguamish Tribe of Indians has been collecting temperature data in the Stillaguamish Watershed this summer. Here's an overview of the collection effort and temperatures at 7 locations in the Stillaguamish. The locations are:

- NF Stillaguamish @ Fortson (located in bottom of pool)
- NF Stillaguamish @ Hazel (located in bottom of pool)
- NF Stillaguamish @ Mouth
- SF Stillaguamish @ Mouth
- Mainstem Stillaguamish above Diversion Dam
- Mainstem Stillaguamish @ Smolt Trap Site
- Hatt Slough @ Marine View Drive

Each site has a graph of 15-minute interval temperature data followed by a summary table of the Daily Minimum, Median, Maximum, Mean, Variance, and Sample Size. Most sites have data through 7/9 or 7/10, although the South Fork site has run out of water so data is truncated at 7/1 (which is unfortunate, because it appears that highest temps were reached on 7/3-7/4).

Fortson remains quite cool, but there haven't been many fish observed at this location. The pool at Hazel was reaching temperatures above 21 C for about 3-5 hours daily. The South Fork and the Mainstem have essentially been thermal barriers to fish since 6/26/2015 with sustained temperatures above 21 C over the last two weeks (6/26-7/10).

Report shared by [Jody Brown](#), Fisheries/Water Quality Biologist with Stillaguamish Tribe of Indians. Connect with Jody for the data to which she refers!! Thanks much, Jody!

South Fork Tolt River: (FERC#2959):

Summary: After reviewing the available literature, the Tolt Fish Advisory Commission (TFAC) recommended that instream 7-DADMAX be temporarily increased from 16° C to 17.5° C in order to release as much surface water as possible so that cooler water will be available in the fall when adult Chinook and coho return to spawn in the lower portion of the river. In addition the TFAC recommended removing the bull trout temperature designation from the upper portion of the river.

Report: Seattle City Light (SCL) has been able to maintain the instream flows in the South Fork River. Of concern is maintaining the required instream temperatures throughout the drought. SCL does not have a 401 certification so they are regulated under WAC-173-201A-200 (1)(c). The upper third of the river is within elevation of bull trout habitat and water temperatures are set at 13° C 7-DADMAX even though bull trout are not present. The lower levels are considered core summer salmonid habitat with water temperatures set at 16° C 7-DADMAX.

Ecology contacted WDFW about the ability of SCL to maintain water temperatures at 13° C 7-DADMAX. WDFW worked with SCL to gather species presence, life history information and optimal and lethal temperatures associated with the species and life history present. Since bull trout are not found in the South Fork Tolt, the most sensitive species/life history present in the river is steelhead juveniles. The scientific literature reports optimum temperature for steelhead juveniles as 14 to 15° C and 20.5° C 7-DAM.

The Tolt Fish Advisory Commission (TFAC) reviewed the information and recommended that SCL release as much surface water as possible and meet a 17.5° C 7-DADMAX. The justification is to release as much hot water as possible so that cooler water will be available in the fall when adult Chinook and coho return to spawn in the lower portion of the river. The optimal spawning temperature range is 5.6-14.5°C and 4.4-13.3°C respectively and the incubation range is 5-14.4°C and 6-10°C respectively.

Cedar River Instream Flow Commission:

Summary: Seattle Public Utilities (SPU) are meeting instream flows for the firm supplemental block of water (164 cfs). Normally SPU targets 10 cfs above the established criterion but requested to directly target instream flows for the firm supplemental block of water. This may result in flows going below the firm supplemental block of water targets. The operators have 6 hours to adjust flows back to the target level and any deviations are not allowed to go more than 10 cfs below the firm supplemental block of water targets.

Report: The 3,500 acre foot non-firm (voluntary) supplemental block of water, usually released June 16 to August 4, was not allocated this summer. Seattle Public Utilities (SPU) are meeting the firm supplemental block of water. Minimum instream flows are 89 cfs at this time. With the firm supplemental block of water the standard is 164 cfs. SPU historically releases an additional 10 cfs as a buffer to prevent the flows from going below 164 cfs during operations. In an effort to conserve additional water in storage from the Cedar River SPU proposed to eliminate the buffer of 10 cfs and directly target the 164 cfs resulting in some fluctuation below 164 cfs. Flows will not be allowed to drop more than 10 cfs below the Flow Target with Firm Block Allocated (see table). If flows in the Cedar River as measured at the USGS Gage 12117600 (Below Landsburg) drop below the Flow Target with Firm Block Allocated (164 cfs), Landsburg Operators will have 6 hours to make the necessary operations to reestablish the target flow. It is expected that there will only be a few very minor excursions below the Flow Target. The City is committed to providing the full 2,500 acre feet Firm Block and will make the necessary adjustments to the end of the schedule (August 5) to ensure compliance. This has been approved by the IFC.

Date Flows Change	HCP Minimum Flow w/out Blocks	Flow Target with Firm Block Allocated	Flow Firm Block Buffer (-10 cfs) below Target	Flow Firm Block Range (cfs) with Lower Buffer
14-Jul	109	164	10	164 cfs - 154 cfs
19-Jul	84	134	10	134 cfs - 124 cfs
24-Jul	84	118	10	118 cfs - 108 cfs
29-Jul	83	108	10	108 cfs - 98 cfs
2-Aug	83	95	10	95 cfs - 85 cfs
5-Aug	83	83	*	*

*Adjustments made to meet 2,500 acre feet commitment

Other drought related tools available to SPU are the City well field, a pumping plant to mobilize dead storage, educational outreach and evoking the Critical Low Flow plan. The floating

pumping plant is moved into place when Morse Lake elevation reaches 1543 ft. Pumping will begin when the elevation reaches 1539 ft.

In addition hydrologic and reservoir conditions have been established that indicate a degree of drought and trigger an alert phase in which the City will consult with the IFC in order to assess overall supply and fishery conditions, demand management, and forecasts. For example if on July 18th Lake Morse elevation is less than 1553 ft, and average inflow to Morse Lake for the antecedent eight week period is less than 167 cfs the City may initiate additional criteria (conservation measures) found in the 1993 Water Shortage Contingency Plan and reduce flows to the Critical Low Flows. Critical low flow for this period is 80 cfs. On August 1st if Lake Morse elevation is less than 1552 ft, and average inflow to Morse Lake for the antecedent eight week period is less than 110 cfs and other conditions are met, the Critical Low Flows are 70 cfs.

Current lake elevation is 1550.29 ft, and 8 week inflow average 33.5 cfs, meeting the hydrologic and reservoir conditions but SPU has chosen not to pursue the Critical Low Flows (which as shown, provide for even lower stream flows than the standard agreement). The elevation is above the elevation to start mobilizing the pump storage plant. (Peggy Miller, Renewable Energy Section, Habitat Program)

King County Flow and Temperature Conditions

Correspondents Curtis DeGasperi and Jim Simmonds from King County Department of Natural Resources and Parks present the following report on King County river and creek flow and temperature summary for week of 7/6-7/12. Request data and/or get on Jim's distribution list at Jim.Simmonds@kingcounty.gov

STATUS

- 13 out of 15 rivers with over 15 years of flow data and real-time data delivery had the lowest flows ever recorded for the week.
- 10 out of 21 creeks with over 15 years of flow data and real-time data delivery had the lowest flows ever recorded for the week.
- 9 out of 13 rivers/streams with over 15 years of temperature data and real-time data delivery had the highest temperatures ever recorded for the week
- Lake Washington water levels are the lowest ever recorded for the week based on U.S. Army Corps of Engineer records that go back to 1940. The U.S. Army Corps of Engineers anticipate Lake Washington's level will drop below 20 feet this summer, the first time since October 1987, and are taking steps to conserve water during this year's drought. Temperature data at the fish ladder at the locks were not available for last week due to technological problems, but were the highest for the week the previous week since record-keeping began in 2004.

ECOLOGICAL IMPACTS

- Lower than normal flows and elevated water temperature can harm salmon and other fish at several points of their life cycles. In particular, adult salmon could have difficulties reaching upstream spawning grounds if flows remain below normal.
- Maximum temperatures in the Cedar River (at Renton), Bear Creek, Jenkins Creek, Laughing Jacobs Creek, and Little Soos Creek were between 20 degrees C and 23 degrees C, which can cause thermal stress to salmonids.

- Temperatures in the Sammamish River exceeded 23 degrees C, spiking at over 27 degrees C, which can have substantial impacts on salmonid health.
- Given the results for the week of June 28 through July 5, temperatures at the fish ladder at the locks for the week of July 6 through 12, while not available, likely are at or near a migratory barrier of 21 degrees C for salmon returning through the locks in June through September. Over 150,000 sockeye salmon are forecast for 2015, peaking in early July.

REGULATORY AND LEGAL CONSIDERATIONS

- Flow in the Snoqualmie River is lower than the minimum instream flow established by Washington Administrative Code, which allows the state to curtail withdrawals by holders of junior water rights.
- Flows in the Green River are higher than instream flows required during drought years for Tacoma Public Utilities to withdraw water from the Green River using its primary water right, but are below minimum flow requirements for Tacoma Public Utilities to withdraw water from the Green River with its second diversion water right.
- Flows in the Cedar River are meeting the normal minimum flow required to be maintained by Seattle Public Utilities during normal years.

River Flow Summary

Status	Regulated Rivers*	Unregulated Rivers
Lowest flow ever for week	Green near Auburn	Skykomish near Gold Bar Tolt (mainstem near Carnation, N Fork, S Fork above reservoir near Index) Snoqualmie (mainstem at Carnation, S Fork, M Fork, N Fork) Raging Cedar above reservoir Sammamish at 116 th White above Mud Mountain
Typical flow for week	Cedar at Renton S Fork Tolt below reservoir	

*Data for White River at Auburn downstream of Mud Mountain Dam only available since 10/1/2007

Creek Flow Summary*

Status	WRIA 8**	WRIA 9	WRIA 10
Lowest flow ever for week	Issaquah (at Hobart), Rock, Taylor (Selleck), Thornton, Bear	Covington, Judd, Little Soos, Soosette	Boise
Lower flow for week than during 90% of other years	Issaquah (at Mouth)	Jenkins, Soos	
Below typical flow for week		Des Moines (mouth)	
Typical flow for week	Juanita, Laughing Jacobs, McAleer, Mercer	Springbrook, Mill- Kent (mouth)	
Above typical for week		Crisp	

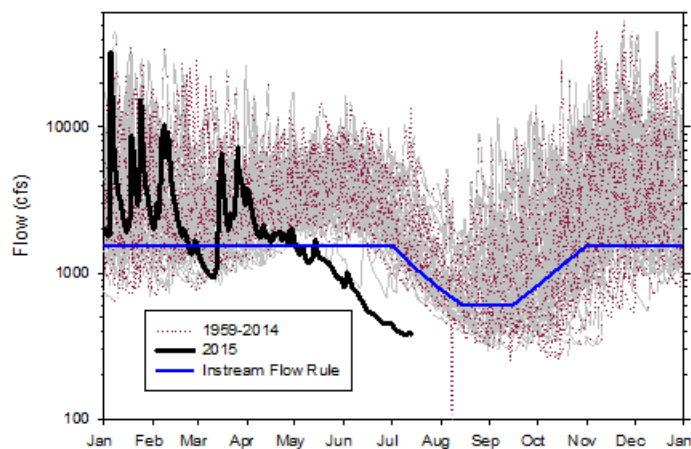
*No creeks in WRIA 7 have 15 years of flow data and real-time data delivery

**Lyon Creek was not updated this week – gage being moved due to culvert replacement project

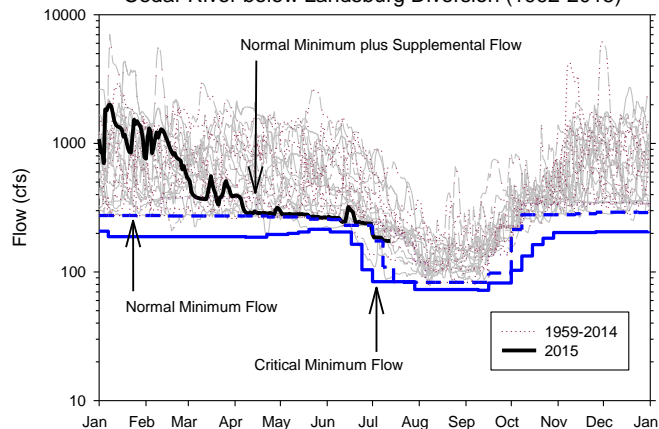
River and Creek Temperature Summary

Status	River/Creek
Highest temperatures ever for week	S Fork Tolt (above reservoir near Index and below reservoir near Carnation), Cedar (above and below reservoir and at Renton), Sammamish, Bear, Laughing Jacobs, Jenkins
Temperatures for week higher than during 90% of other years	
Higher than typical temperatures for week	Crisp, Little Soos
Typical temperatures for week	Soosette, N Fork Tolt

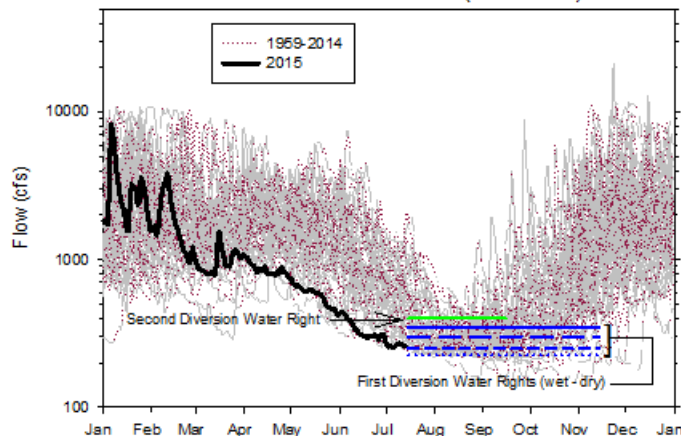
Snoqualmie near Snoqualmie (1959-2015)



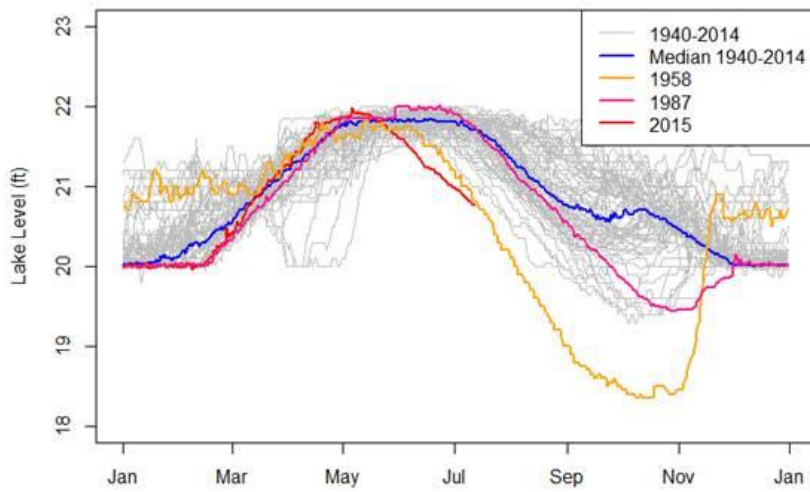
Cedar River below Landsburg Diversion (1992-2015)



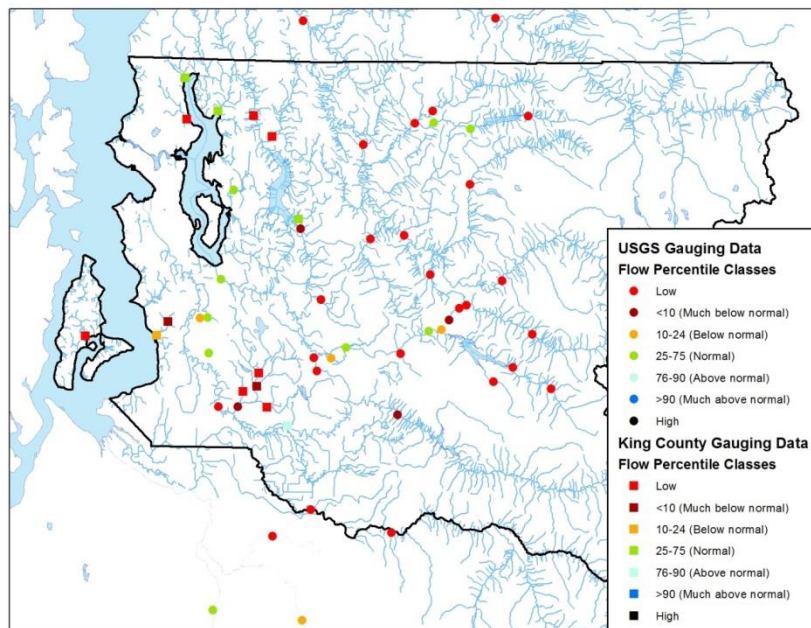
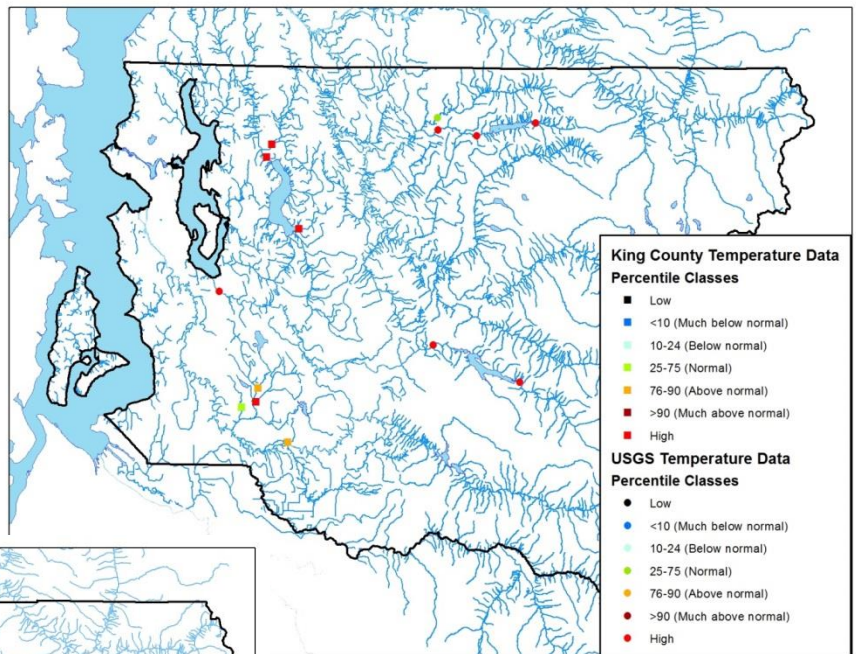
Green River near Auburn (1959-2015)



1940-2015 Lakes Washington & Union Elevation



Many thanks to King County for sharing this information with us!



Green River Flow Forum:

Summary: Flows into the reservoir at Howard Hanson Dam are breaking the same day record lows but the ACOE do not expect the rate of change to remain the same through the summer. The ACOE is drafting the reservoir to meet continuous minimum instream flows at Auburn. Instream flows at the Palmer gage are below the continuous minimum instream flow curtailing Tacoma's use of the First Diversion. The ACOE have very little ability to modify water discharge temperature due to the limited elevation differences of discharge facilities.

Report: On July 14th the lowest recorded historical average daily flow into the reservoir at Howard Hanson Dam was 180 cfs. The July 14th 2015 average daily flow was 130 cfs, shattering the record with a 50 cfs difference. Low flows continue to be a concern throughout the system.

The 1995 *Agreement Between the Muckleshoot Indian Tribe and the City of Tacoma Regarding the Green/Duwamish River System* established guaranteed minimum instream flow levels that vary with annual conditions. For drought years the minimum continuous instream flow at the Auburn Gage ranges from 250 cfs to 225 cfs depending on the severity of the drought. In addition instream flows at the Palmer Gage must be above 200 cfs from July 15 to September 15 and above 300 cfs from September 16 to October 31 as a condition for Tacoma to withdraw water from the Green River utilizing their Second Diversion water right. Tacoma restricts First Diversion water right withdrawal in order for the ACOE to maintain the federally mandated minimum instream flows. When reservoir inflow and storage are not sufficient to maintain the 250 cfs at Auburn Gage and the First Diversion water is partially curtailed, Tacoma has the option of reducing minimum flows to 225 cfs.

Current reservoir elevation is approximately 1661 ft, inflows average at 125 cfs and outflows average 200 cfs. Flows at Auburn are approximately 260 cfs. Flows at Palmer Gage are ranging between 120 and 130 cfs so Tacoma is not using their First Diversion.

Cushman Dam (FERC#460 operated by Tacoma Power):

Tacoma Power held a public meeting at the Lake Cushman fire hall on June 23, 2015. The question was asked why the utility does not reduce discharge from No. 2 Dam to the 100 cfs minimum allowed in July and August by license article 407. The 2015-2016 Flow Plan prescribes a flow of 120 cfs for those months. Committee members indicated they want to maximize juvenile rearing habitat in the summer, and don't yet have enough information to understand the significance of the 20 cfs difference on the biological system. They prefer to err on the side of caution until enough information is obtained to make an informed decision on summer instream flows.

Skookumchuck: (FERC #4441)

Meeting being scheduled to evaluate the drought condition.

Wynoochee Dam (FERC# 6842):

Tacoma Power believes there is enough water available behind Wynoochee Dam to provide 190 cfs minimum flows. The water behind the dam is becoming increasingly warm. The FERC License provides a temperature objective range of 50 – 58 degrees Fahrenheit (F) with an optimal discharge of 55 F. The Wynoochee Fisheries Technical Committee recommended

increasing the upper range of the outflow temperature objective range to 16 C (60.8 F), consistent with the Washington State surface water criteria of core summer salmonid habitat, during the period July 15, 2015 to December 31, 2015. Tacoma Power will:

- 1) Continue discharging water at a minimum of 190 cubic feet per second (cfs) from Wynoochee Dam.
- 2) Increase the upper threshold of the discharge water temperature band from 58 to 60.8 degrees Fahrenheit until December 31, 2015.
- 3) Manage low flow gates to achieve the optimal discharge water temperature of 55 degrees Fahrenheit.
- 4) Provide multi-elevation reservoir water temperature and discharge water temperature data to the Wynoochee Fisheries Technical Committee (WFTC) members on a bi-weekly (every two weeks) basis.
- 5) Provide updated Wynoochee reservoir elevation probability curves to the WFTC members on a bi-weekly basis.

Nisqually (FERC# 1862)

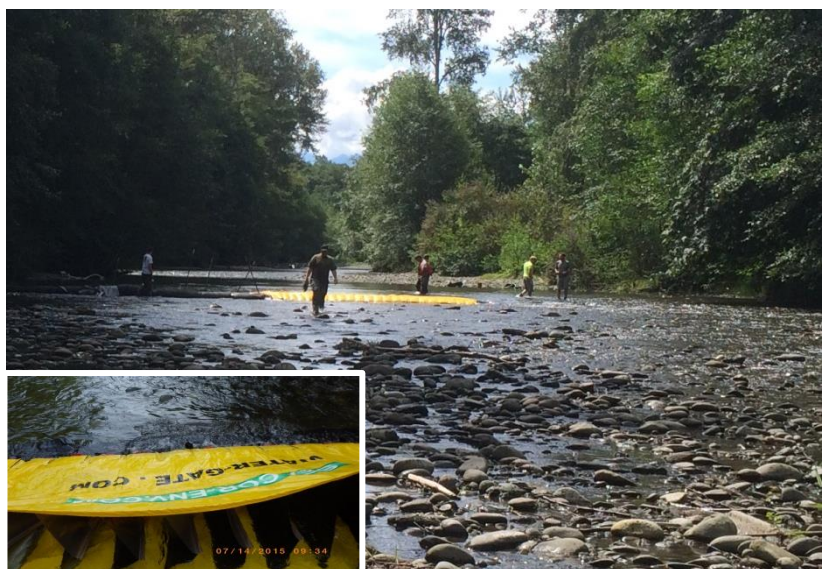
Tacoma Power has indicated they are concerned about water availability and minimum flows. No written communication has been received. More temperature and flow data next week.

Electron Dam

No significant activities have occurred this month for the Electron Dam project. Renewable Energy continues to monitor project activities. (Peggy Miller, Renewable Energy Section, Habitat Program)

Dungeness

Biologists from WDFW and the Jamestown s'Klallam Tribe tested low flow blockage remediation methods in the Dungeness River this week. A new portable baffle dam ("water gate") (yellow in photo & inset) borrowed from the Ecology/WDFW spill teams came out as the hands-down winner for high effectiveness and low impact at the test site. A water-filled bladder dam (to left of water gate) was more difficult to deploy, heavier, and required more invasive anchoring than the other method. While the bladder dams will have applicability in some settings and situations, WDFW is procuring more of the water gates for deployment later this summer in the Dungeness. Biologists estimate the Dungeness will



require this intervention in 2 to 3 weeks, because flows are still diminishing there. Many thanks to Katrina Simmons, Jonathan Kohr, Robert Granger, HPA lead Chris Waldbillig, and project coordinator Scott Williams and crew for their work this week! Thanks also to Randy Cooper (WDFW), and Chris Burns, Aaron Brooks and crew from Jamestown! See more low flow blockage remediation news under “headquarters activities.”

Lewis River Dams (FERC# 935/Merwin, 2071/Yale and, 2111/Swift No. 1 operated by PacifiCorp, and 2213/Swift No. 2 operated by Cowlitz PUD):

Summary: The Lewis River Flow Coordination Committee (FCC) and Washington Department of Ecology agreed to reduce the minimum flows below Merwin Dam to preserve water for fall spawning. Minimum flows were reduced to 1200 cfs from July 11th to July 30th. Current instream flow is 1260 cfs.

Report: PacifiCorp can store water in Merwin, Yale and Swift reservoirs but the reservoirs are currently below the normal elevations for this time of year. Minimum instream flows are measured at the Ariel Gage below Merwin Dam. License required minimum flows are provided in the table.

Date	License Required Flow (cfs)
March 31-June 30	2,700
July 1 - July 10	2,300
July 11 - July 20	1,900
July 21 - July 30	1,500
July 31 - October 15	1,200
October 16 - October 31	2,500
November 1 - December 15	4,200
December 16 - March 1	2,000
March 2 - March 15	2,200
March 16 - March 30	2,500

In coordination with the Lewis River Flow Coordination Committee (FCC) and Washington Department of Ecology, minimum instream flows were reduced to preserve stored water for fall spawning flows. The established minimum flow to be released at Merwin this time of year is 2300 cfs. At the time of the decision all three reservoirs combined were over 40 feet lower than normal. In order to preserve water for the biologically sensitive fall spawning period, the FCC agreed to the following modified minimum flow schedule. Current discharge is 1260 cfs.

Date	Minimum Flow
July 3 – July 10	1500 cfs
July 11-30	1200 cfs
July 31 – October 15	800 cfs

Cowlitz River Dams (FERC # 2016 - Mayfield & Mossyrock dams operated by Tacoma Power):

Summary: Current flows below Mayfield Dam are 3020 cfs, 1000 cfs above minimum. This will reduce the amount of water available for fall flows when spawning occurs.

Report: Minimum instream flows for Tacoma Power’s Cowlitz River projects are documented in the Settlement Agreement and measured below Mayfield Dam. March 1 – June 30 minimum

instream flows are 5000 cfs but the Cowlitz River Fish Technical Committee (FTC) agreed to reduce flows to 4000 cfs through April then to 3000 cfs through June to increase the probability of Riffe Lake refill. Mayfield Dam is operated as a run of the river facility where as Mossy Rock is operated as a flood storage dam. Riffe Lake did not fill to the desired level but did meet average refill elevation.

The minimum instream flow for July 1 through August 14, is set at 2000 cfs. The current average daily instream flow is 3020 cfs. This 1000 cfs above the minimum flow is not for fish but for meeting electrical load demand. Juvenile fish will benefit from the flows above minimum but it might jeopardize the ability to increase flows in the fall.

Cowlitz Falls (FERC#2833 operated by Lewis County PUD):

Cowlitz Falls is a run of the River facility. When Riffe Lake is below elevation 750 ft, the flow below the Cowlitz Falls Dam is maintained at a minimum of 1,000 cfs or inflow to the Cowlitz Falls Project reservoir, whichever is less. When Riffe Lake is above elevation of 750 ft and extends to Cowlitz Falls Dam, no minimum flows are required below Cowlitz Falls Dam. Lewis County PUD can then alternate between increasing the reservoir level by not passing any flows and generating.

Riffe Lake elevation is currently at 761 ft and inflow (Packwood) is 493 cfs. Lewis County PUD is currently alternating between pooling and generation.

Note: Lake Scanewa will be drawn down September 2015 for dam maintenance and coffer dam placement for the surface collector construction.

Packwood: (FERC#2244)

The Packwood facility is not connected to the Cowlitz River. It is located at the outfall of Packwood Lake that supports an endemic population of red band trout. (Peggy Miller, Renewable Energy Section, Habitat Program)

Snake & Columbia Rivers

Columbia River mainstem from Bonneville Dam to Chief Joseph and above yielded devastating adult sturgeon and sockeye mortalities this week. Columbia River conditions are lower, warmer, and clearer than recent five- and ten-year averages. Current outflow at Bonneville Dam is averaging 137 kcfs for July, compared to the recent five-year average for July 1-14 of 287 kcfs. Water temperatures have been above average all year and currently average 74° F for July 1-14, compared to the five-year average of 64° F for this same timeframe.

White Sturgeon

Over the past 1-2 weeks, numerous reports have been received of sturgeon mortalities in the Columbia River. The frequency and magnitude of the reported mortalities have increased sharply in recent days. The majority of these accounts have reported the sturgeon to be large, over-sized fish generally considered as broodstock. At least 80 sturgeon mortalities have been observed by agency or enforcement personnel from Priest Rapids Dam to Bonneville Dam, primarily in John Day Pool. Another 20 sturgeon mortalities have been observed below Bonneville Dam, primarily in the Willamette River, bringing the total to 100 documented

mortalities. These figures do not include potential counts from Oregon Department of Fish and Wildlife (ODFW), federal, or WDFW in locations above McNary Dam or below Bonneville.

While there is apparently no production from this year's breeders, the die-offs represent a small portion of the overall population of these large-sized fish in each reservoir. The greatest impact has been to the John Day Pool population, where the die-off so far represents two percent of the oversize population segment. Depending on conditions going forward, the majority of sturgeon broodstock will live to spawn another day. It's never that simple, though. Sturgeon physiology includes a mechanism to reabsorb all the eggs an animal would have released had she not been disturbed, and starts the maturation cycle all over. This means that a female sturgeon that has been disturbed during spawning may not spawn again for another three or four years.

The joint staff of WDFW and ODFW is investigating the cause of the mortalities, however, due to the rapid decomposition, the cause may be difficult to discern. What we do know is that most of the super-sized sturgeon carcasses had bellies full of adult sockeye. Elevated water temperatures (which increase metabolism) and potentially low dissolved oxygen levels in the water are likely significant factors contributing to the mortalities.

In an effort to reduce any additional potential stress to the sturgeon populations, WDFW and ODFW fishery decision makers announced yesterday a prohibition on all sturgeon angling (including catch and release) in waters of the Columbia Basin (including the Snake River) above Bonneville Dam and in the Willamette River. (Olaf Langness, Region 5)

Sockeye

Warm temperatures in the Columbia are affecting returning adult sockeye as well. Although these high temperatures are often seen for at least short periods later in the summer in a normal year, they have occurred more than a month before usual and have arrived before the latter half of the sockeye run could make it upriver (the peak passage at Bonneville Dam typically occurs at the end of June).

The first sign of trouble, which started at the end of June, was the appearance of adult sockeye holding in the lower ends of several cold water Columbia gorge tributaries (e.g., Wind, White Salmon, Drano Lake). Although steelhead are well known to use these areas for thermal refuge during their upriver migration, often waiting weeks or months before resuming migration in good condition, sockeye have never been observed to do so in any numbers.



Seattle Times via Tri-City Herald



Sockeye mortality Wind River
7/12/15 Thomas Buehrens



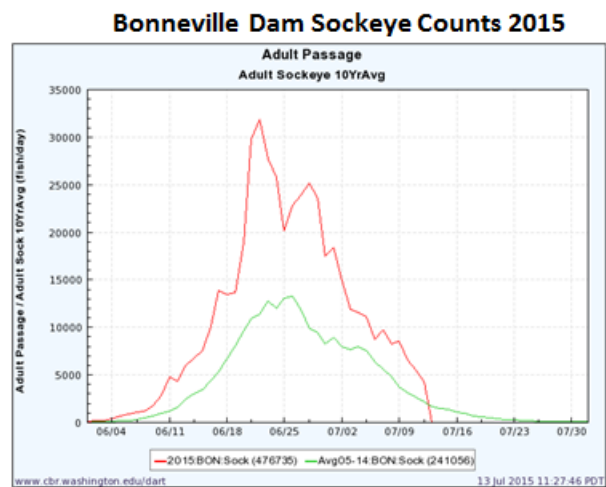
The major thermal refuges between Bonneville and McNary are the Wind, White Salmon and Drano/Little White Salmon (Bonneville Pool; Washington side), and the Deschutes (Dalles Pool, Oregon side). On the lower Wind and lower White

Salmon on July 12, there were small schools of sockeye in every pool (never seen before), and carcasses everywhere (photos previous page). This was in the flowing portions of the rivers above the slack water at their mouths. There are likely a lot more fish lower down in the slack water. Virtually all live fish seen had signs of skin lesions or missing patches of skin and scales, mold/fungus/bacteria growth, and were lethargic. At least 50 carcasses were counted in the Wind, and an additional couple hundred live fish were seen to be in mortal distress.

The next sign that things were looking bad was the drop in dam counts at upriver dams. First, the count at Bonneville (right) . 2015 (in red) is a much larger than average (green) run. The Bonneville counts show a pretty normal distribution. Below are some photos of sockeye observed at Bonneville Dam during July 5-11.

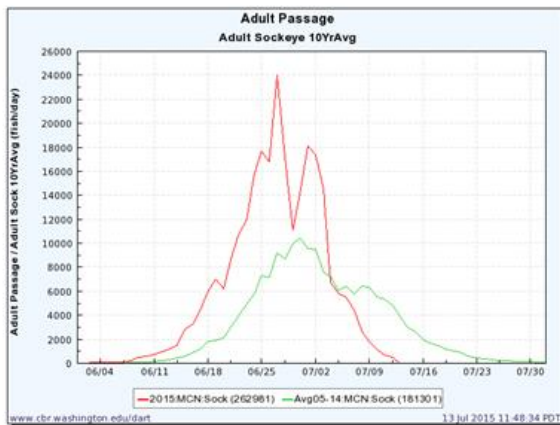


Photos courtesy Kenneth Lujan, US Fish & Wildlife Service
Lower Columbia Fish Health Center

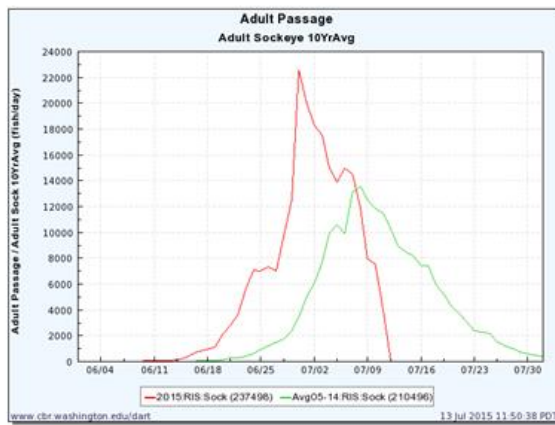


In contrast, counts at McNary Dam (next page) are truncated since the beginning of July, indicating that fish are either not moving upriver, are not surviving, or both. Also note that the **total passing McNary** is approximately **210,000 less** than Bonneville. Considering the average migration time from Bonneville to McNary is about a week, we should not be missing anywhere near this many fish. The counts at Rock Island (upper Columbia stocks, also shown next page) demonstrate the same pattern as McNary. Indeed most (roughly 237,000 out of 263,000) have made it from McNary to Rock Island (just below the Wenatchee River) and some are undoubtedly still in transit.

McNary Dam Sockeye Counts 2015

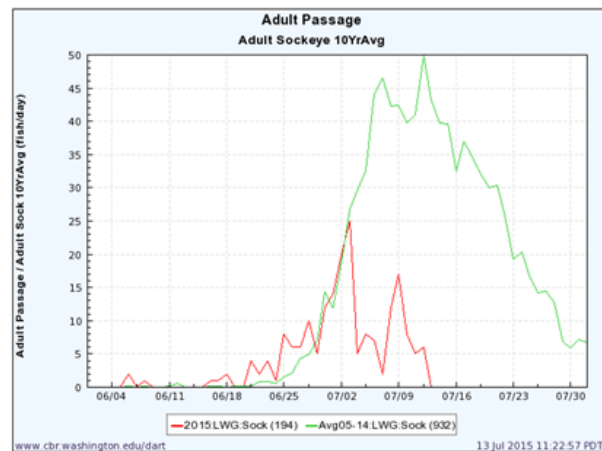


Rock Island Dam Sockeye Counts 2015

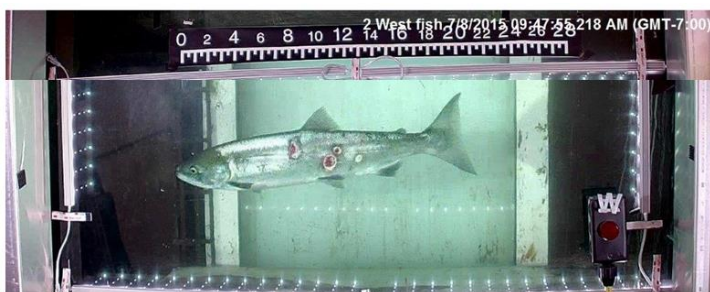


Finally, at right are the counts at Lower Granite on the Snake (the Endangered Snake River Run). As you can see, we are just now getting to the typical peak passage timing (green) but the 2015 counts (red) have dropped before ever really getting started—this despite PIT tag data indicating a run size much above average at Bonneville.

Lower Granite Dam Sockeye Counts 2015



So what does this all mean? One would hope that the fish are simply delaying migration, and those that are doing so are in good shape. Evidence doesn't support this, however. An unusually large number of sockeye that are passing Wells Dam are showing distinct lamprey wounds (below), and observers are seeing fungus on these injuries. Wells reservoir temperature has already warmed to what is typically observed in mid-August, and it could be late September or October before the Okanogan River is cool enough for sockeye to move upstream to Canadian spawning grounds.



Provided by Tom Kahler, Douglas County PUD

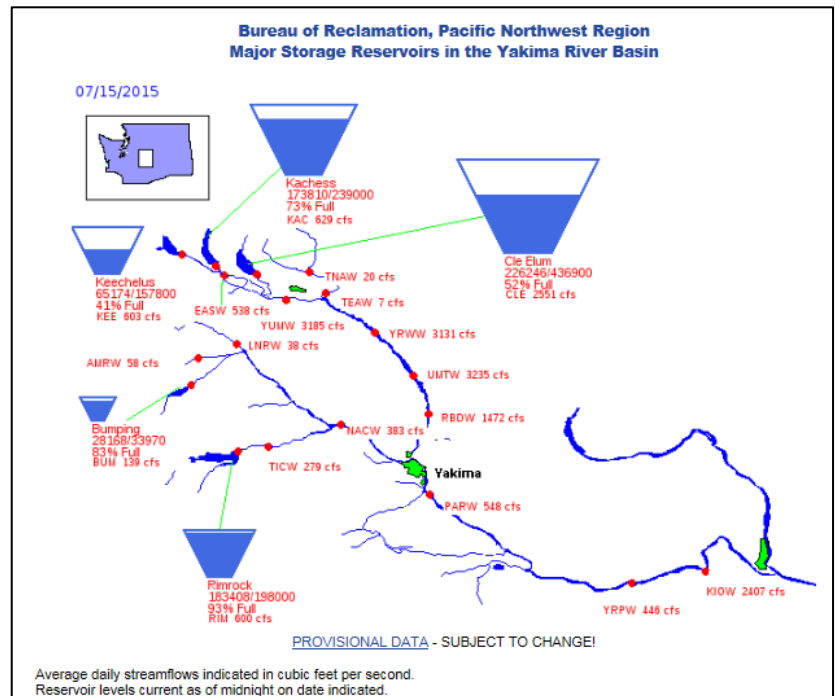
Based on the drop in upriver (McNary and upstream) dam counts, knowledge that these fish usually average less than a week to travel from Bonneville to McNary, and the condition of those fish that are seeking thermal refuge, it appears that the latter half of the entire sockeye run arriving at Bonneville will mostly perish before they make it to their natal streams.

(Thomas Buehrens, Fish Ecology and Life Cycle Monitoring Unit, Fish Science Division)

Yakima

The Bureau of Reclamation's Mid-July 2015 Total Water Supply Available forecast for the Yakima Basin indicates a full water supply for senior water rights during the 2015 irrigation season, but an estimated 46 percent supply for junior water rights. This is a 2 percent increase for junior water rights over the early July rate. The increase is derived from reservoir storage being higher than projected and a current weather forecast of cooler and possibly wetter conditions. Let's hear it for the pessimistic view!

The Reclamation Teacup Diagram (right) for Yakima Basin shows Lake Keechelus volume down to 41%, Kachess down to 73%, and Cle Elum down to 52%. Bumping is at 83% of full, and Rimrock has begun to draw (93% full). Storage is 77.7% of average (1981-2010). Inflow to the five reservoirs is 29%, releases from the five are 85% and major canal diversions are 78% of average for July 15.



Manastash Creek

Drought Central received a photo from Sherry Swanson of Kittitas County Conservation District showing a deer wading July 14 in Manastash Creek at Cove Road. Compare this to the June 2, 2015 photo at the same location. The increased flows are attributable to a "water-wheeling" project that routes irrigation water destined for lower Yakima irrigators through the Kittitas Reclamation District (KRD) ditches and thence to small creeks like Manastash before returning to the mainstem Yakima River. Many thanks to the Kittitas Reclamation District for agreeing to the conditions of water-wheeling and for implementing the projects making it possible. Also recognized is the Yakima River Basin Water Enhancement Project Workgroup for supporting the projects making this possible. Finally, thank go to the WDFW Region 3 Fish and Habitat program staff who worked hard over several years to help make this possible!



Manastash Creek at Cove Road
Left July 14; Above June 2

WDFW Headquarters Drought Response Activity

Let 'em Pass Signs: Signs are distributed to WDFW office and a couple hundred remain, so **partners are invited** to contact WDFW Drought Coordinator Scott for signs to post. Remember to obtain landowner permission prior to any posting on public or private land.

Low Flow Blockage Remediation Program and HPA: Draft Hydraulic Project Approval provisions are under review for an HPA that would be issued for agency-led drought remediation projects. The Low-Flow Blockage Remediation Program document is being revised based on comments received internally and from tribal staff. An update will be completed next week, after which the HPA can be finalized and issued. The Program document sets forth a protocol for proposing a low-flow blockage remediation (also known as “fish salvage”) project, building a team to conduct an assessment, achieving approval to implement the project, and post-project evaluation. Project teams will include at least one WDFW staff person, and must also include an HPA biologist during project development and assessment. WDFW is anticipating a very large role for tribal staff and other partners in designing, assessing, and implementing projects. The WDFW Drought Coordinator will make the final determination to approve projects upon consultation with regional program managers. The protocol is not intended to be difficult to accomplish, but is designed to achieve accountability for projects and expenditures. More details to follow next week.

Report your observations - Report looming, suspected, or real-time blockages, stranded fish, and drought-related fish die-offs to your regional program manager AND to Drought Coordinator Teresa Scott at teresa.scott@dfw.wa.gov . Stay tuned for a centralized reporting mechanism on the Habitat Program Sharepoint site – I know this promise is old, but I really do promise we will have something easy in place before October!

Ecology Drought Relief Grants: Ecology announced this week that part of a \$16 million appropriation from the Legislature will be distributed through a drought grant program. The Washington Department of Ecology is accepting [grant applications](#) for public projects that ensure reliable public water supplies, augment water supplies for farmers, and rescue or preserve fish runs in streams. This will be a helpful program for getting a lot of drought needs met; however, WDFW is not relying on this grant program. WDFW is working directly with Ecology to obtain drought funding to meet our drought response needs. Any questions staff has about WDFW’s drought funding can be directed to Drought Coordinator Scott.

Drought-related Hatchery Actions

Drought Related Hatchery Actions for Week of July 13

Region	Facility	Species	Mortality (% production)	Comments & Actions
3	Naches		n/a	Agency water right coordinator Katherine Ryf contacted Ecology; they will accept an application for an emergency well to be funded through WDFW drought funds.
4	Soos Creek	Summer Steelhead	34,000 (50%)	Mortality since 6/27 due to Ich and Furunculosis. Treatment with Terramycin feed.
4	Soos Creek	Coho	153,000 (18%)	Mortality in Pond 9 since 6/27 due to Ich and Furunculosis. Treatment with Terramycin.

4	Wallace		n/a	Water supply dropping. Have contingency plan to release fish or move to alternative facility.
5	North Toutle	Coho	102,000 (75%)	Mortality in early July due to Columnaris. Remaining fish moved to Cowlitz Trout Hatchery.
5	Washougal	Coho	37,000 (2%)	Mortality in due to Columnaris.
6	Lake Aberdeen	Steelhead	51,000 (15%)	Mortality started in early July and is now dropping. Treating with formalin, salt, and <i>Romet</i> .
6	Naselle	Steelhead	30,000 (38%)	Mortality due to Ich and is now dropping. Treating with formalin.
6	Naselle	Coho	690,000 (47%)	Mortality in early July and has now dropped to normal level.
6	Sol Duc		n/a	Requested HPA to ensure adequate water supply to hatchery.
6	Voights Creek	Coho	347,000 (44%)	Cumulative mortality. Completed treatment with <i>Romet</i> .

Drought-related fishery actions

- Effective July 18: Sturgeon fisheries, including catch-and-release, closed Bonneville Dam upstream in the Columbia River, the lower Snake River, and adjacent tributaries.
- Effective July 18: "Hoot-Owl" restrictions put in place in 8 rivers in Region 1, 2 rivers in Region 3, 4 rivers in Region 4, and 2 rivers in Region 5.
- Effective July 18: Trout, salmon, and steelhead fishery closures in table below:

Drought Related Fishery Actions for Week of July 13

Region	River	Current Fishery	Proposed Rule	Remarks
1	North Fork Touchet above Spangler Creek	Trout	Closed	Extreme low flows. Protect adult spring Chinook and juvenile steelhead
1	South Fork Touchet	Trout	Closed	
1	Wolf Fork (Touchet)	Trout	Closed	
1	Asotin Creek and tributaries	Trout	Closed	
1	Kettle River	Redband Trout	Closed	Extreme low flows and high temperatures; reports of fish mortality. Protect redband trout.
2	Wenatchee River from mouth to Icicle River Road Bridge	Spring Chinook	Closed	Low flow and high temperature; protect ESA-listed steelhead and Chinook; allow passage of sockeye to Lake Wenatchee for escapement.
2	Icicle River from mouth to 500' downstream of Leavenworth Hatchery	Spring Chinook	Closed	Protect ESA-listed steelhead and Chinook.
2	Lake Wenatchee	Trout	Closed	Ensure adequate sockeye spawners.
2	Okanogan River from the Hwy 97 bridge upstream to Zosel Dam	Summer Chinook, Sockeye, Gamefish	Salmon Closed Gamefish Open	High temperature. Protect ESA-listed steelhead and wild summer Chinook
2	Similkameen River mouth upstream to Enloe Dam	Summer Chinook, Sockeye	Closed	

3	Ahtanum Creek	Trout	Closed	Extreme low flow and high temperature. Protect ESA-listed juvenile steelhead and ESA-listed bull trout.
3	Little Naches River	Trout	Closed	Extreme low flow and high temperature. Protect isolated adult spring Chinook and ESA-listed juvenile steelhead.
3	Teanaway River	Trout	Closed	Extreme low flow and high temperature. Protect isolated adult spring Chinook, ESA-listed bull trout, and ESA-listed juvenile steelhead.
4	Raging River	Trout	Closed	Extreme low flow and high temperature. Protect ESA-listed juvenile steelhead.
4	Skykomish River	Summer Steelhead, Trout	Closed, except Near Reiter Ponds Hatchery	Extreme low flow and high temperature. Protect isolated and concentrated ESA-listed adult Chinook, juvenile and adult steelhead.
4	Wallace River	Trout	Closed	Extreme low flow and high temperature. Meet adult Chinook broodstock needs at hatchery.
4	Stillaguamish River upstream of Marine Drive	Summer Steelhead, Trout	Closed	Extreme low flow and high temperature. Protect isolated and concentrated ESA-listed adult Chinook, juvenile and adult steelhead, and bull trout.
4	South Fork Nooksack	Trout	Closed	Extreme low flow and high temperature. Protect isolated and concentrated ESA-listed adult Chinook, juvenile and adult steelhead, and bull trout
4	Buck, Downey, and Sulpher creeks (tributaries to Suiattle River)	Trout	Closed	Extreme low flow. Protect isolated and concentrated ESA-listed adult Chinook,
5	East Fork Lewis River from Lewisville Park downstream	Steelhead, Trout	Closed	High temperature. Protect ESA-listed adult summer steelhead.
5	Washougal River from Mt. Norway Bridge downstream	Steelhead, Trout	Closed	High temperature. Protect ESA-listed adult summer steelhead.

News Clips

[Rich Landers Outdoors Blog](#)

Spokesman Review – ongoing

[Concerns mount as drought deepens](#)

Columbian Special Project July 11, 2015

[Building rock dams in streams harms fish](#)

The News Tribune 11 July 2015

[Project Diverts Water From Irrigation Canal To Yakima River Tributaries To Aid Fish During Low Flows](#)

Columbia Basin Fish and Wildlife Bulletin - July 10, 2015

[Drought-like conditions prompt state fisheries to release trout into Morton Lake sooner than expected](#)

The Seattle Times - July 10, 2015

[Washington ecology lays down rules for drought relief money](#)
Capital Press - July 10, 2015
[Northwest Water Supplies Dropping Amid Drought Conditions](#)
NW Public Radio - July 13, 2015
[Impending drought raises concerns about Elwha River fish](#)
Peninsula Daily News (AP) - July 11, 2015
[State Fish and Wildlife look at ways to ensure fish aren't affected by heatwave and drought-like conditions](#)
The Seattle Times - July 11, 2015
[Depleted water at Naches fish hatchery 'a big problem'](#)
Yakima Herald Republic - July 10, 2015
[City officials ask Oak Harbor residents to use less water](#)
KOMO News - July 13, 2015
[\\$16M Available To Help In Washington Drought Relief](#)
OPB - July 13, 2015
[River temperatures prompt call to close fisheries](#)
King5.com - July 13, 2015
[Washington Fishery Managers Monitoring Stream Flows, Temps](#)
NW Sportsman - July 15, 2015
[Hot, dry weather forcing bears to look for new food sources](#)
Q13 Fox News - July 14, 2015
[Hotter water threatens future salmon fisheries We must continue developing quick and adaptive responses](#)
Chinook Observer - July 14, 2015
[High Temperatures Prompt Cool-Water Releases To Aid Columbia Basin's Migrating Fish](#)
Kuow - July 15, 2015
[State could close some rivers to fishing due to drought](#)
Yakima Herald Republic - July 14, 2015
[Swift Reservoir boat ramp expected to stay dry for months](#)
The Columbian - July 15, 2015
[Dry weather impacting state's wildlife](#)
HeraldNet.com - July 16, 2015
[Warm Waters Cause Central Oregon Salmon Die-Off](#)
KUOW - July 16, 2015
[Sturgeon die-off in Columbia spurs catch-and-release ban proposal](#)
Spokane Spokesman-Review - July 16, 2015
[Northwest Water Supplies Dropping Amid Drought Conditions](#)
OPB July 10, 2015
[Farmers' profits could sustain a hit reaching the millions](#)
Skagit Valley Herald July 12, 2015
[River Temperatures Prompt Call to Close Fisheries](#)
KING 5 News July 14, 2015
[Rural Demand for Municipal Water Or How a Drought Emergency Can Make You Popular](#)
MRSC July 6, 2015
[Dozens of sturgeon found dead in Columbia River](#)
Tri-City Herald July 16, 2015
[Latest water supply figures offer pleasant surprise for Yakima Basin junior rights holders](#)
Yakima Herald July 16, 2015
[Drought Conditions prompt fishing closures](#)
WDFW July 16, 2015
[Drought prompts fishing moratorium for sturgeon on Columbia, Snake Rivers](#)
WDFW July 16, 2015
[Wenatchee Valley irrigation district reduces water](#)

Capital Press July 16, 2015

[Farmers' reactions to Washington State's 2015 drought](#)

Seattle neighborhood farmers markets Tumblr blog July 9, 2015

[Drought Briefing - Washington Burning: Wildfires are adding up](#)

Crosscut July 17, 2015

[State's drought bad, getting worse](#)

The Columbian July 17, 2015

Links

[Ecology's "Washington Drought 2015"](#)

Ecology this week posted a new Dam Safety web page titled [Wildfire Impacts on Dams](#)

Washington State Climatologist [weekly drought update for Washington State](#).

Drought web pages for State departments of [Health](#) and [Agriculture](#)

National Integrated Drought Information System [Pacific Northwest Drought Portal](#)

NOAA [El Nino Portal](#)

[NOAA's Climate Prediction Center](#)

[Northwest River Forecast Center Water Supply](#)

USGS [Real time stream data for Washington](#)

U.S. Army Corps of Engineers [Seattle District Reservoir Control Center](#)

For Further Information:

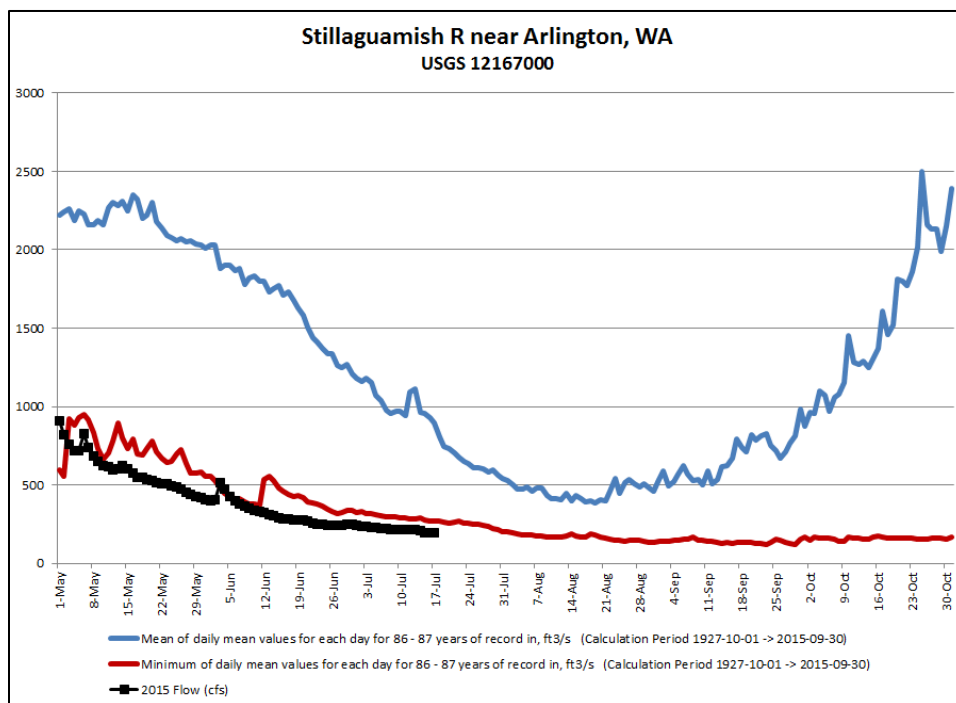
Drought talking points, powerpoint presentations, images, and other drought-related resources are available to staff on the "S" drive.

Contact WDFW Drought Coordinator Teresa Scott at teresa.scott@dfw.wa.gov or (360) 902-2713 with questions and suggestions.

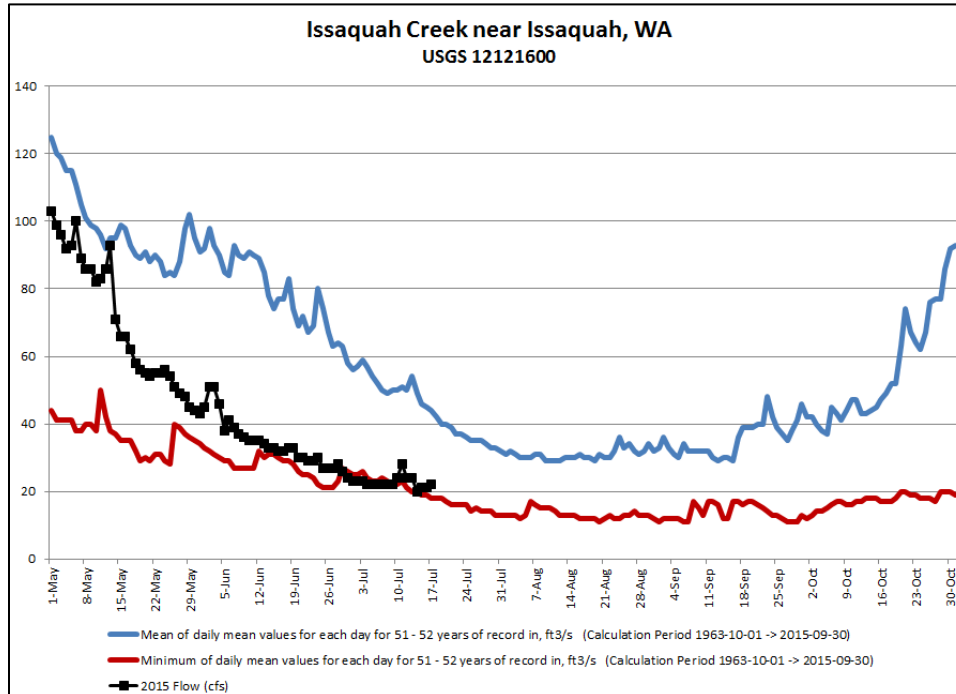
Hydrograph Sampler Charts - Streamwatch (Real Time Flows USGS)

Your author admits to being a data geek, but don't you think these charts are telling us interesting stories? Most streams have passed the period of dramatic flow reductions associated with the end of snow melt. Indeed, most streams didn't experience the runoff peaks normally experienced in the spring. Most streams seem to be settling into the gradually-reducing base flows typically seen in August and September. The question remains, how low will base flows get before the replenishing fall rains arrive?

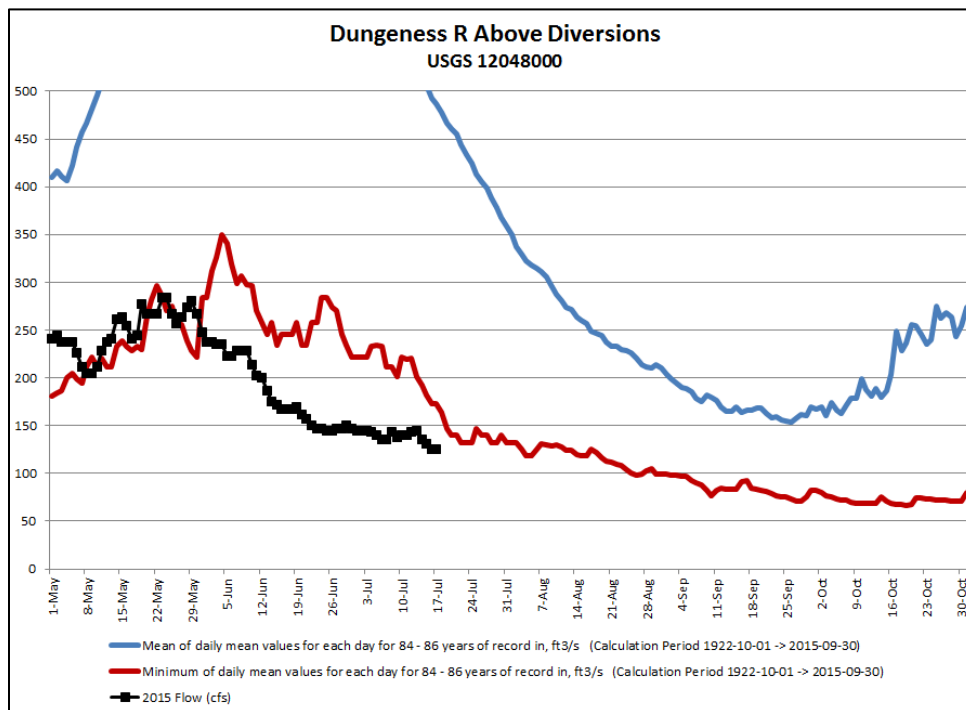
Stillaguamish looks just about as expected for unregulated streams in this neighborhood. Watch for Everett Herald articles about Stillaguamish conditions and drought impacts.



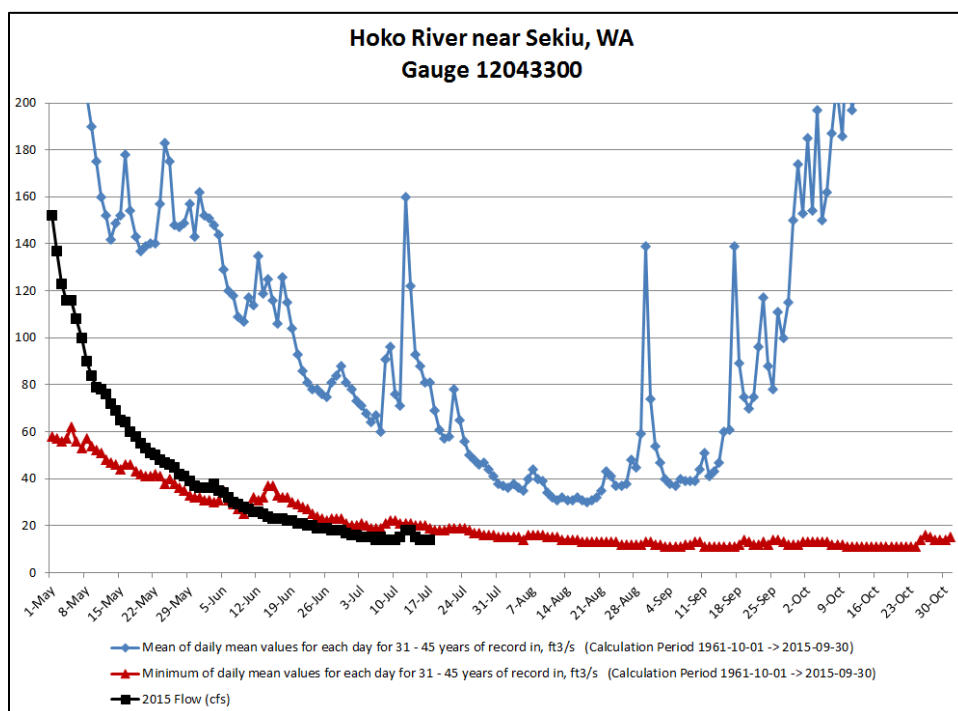
Issaquah Creek remains our star child in terms of above-expected flows. This is not to be interpreted as “good flows”, more like “not as bad as it could be.” I need to learn more about temperatures here.

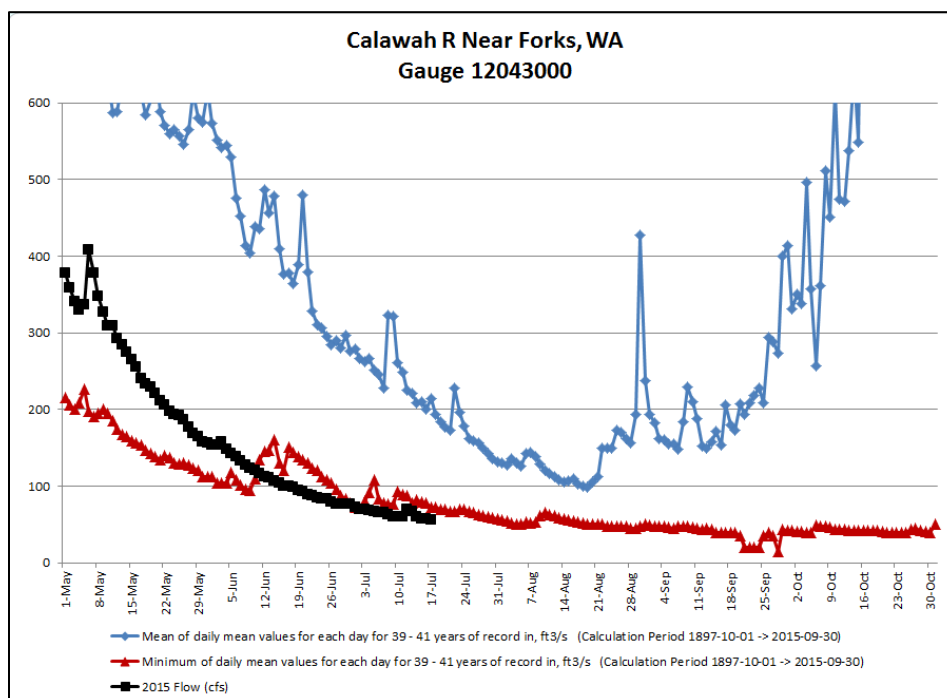


Dungeness is still hanging in there at about 1.5 months ahead of normal.

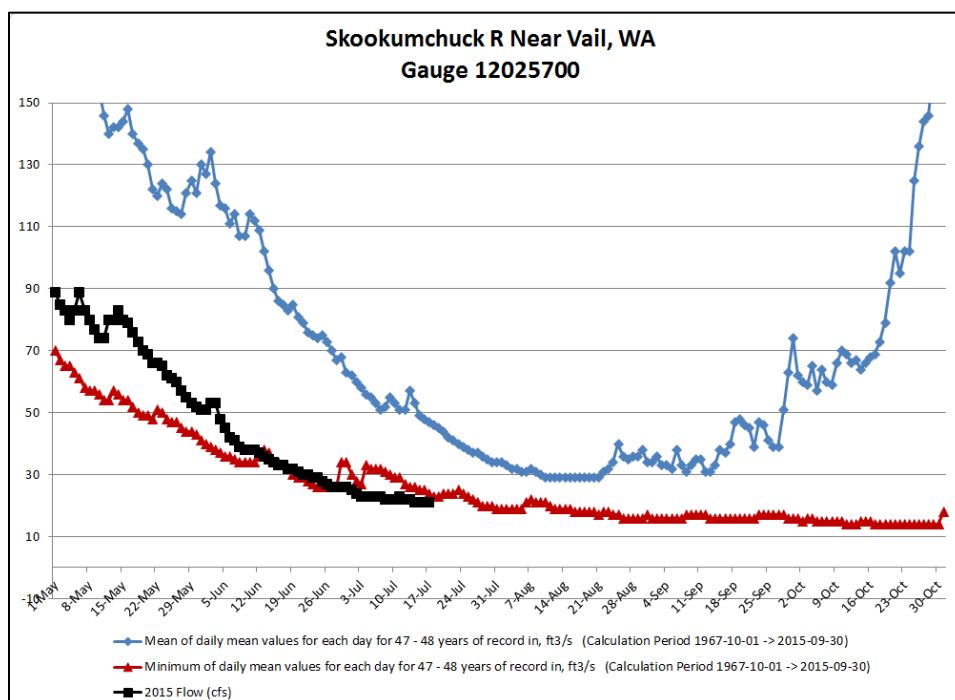


Hoko, Calawah, Hoh, Skookumchuck all looking similar. All these systems appear to continue to decline at slower rates through the end of October – we will see what happens.

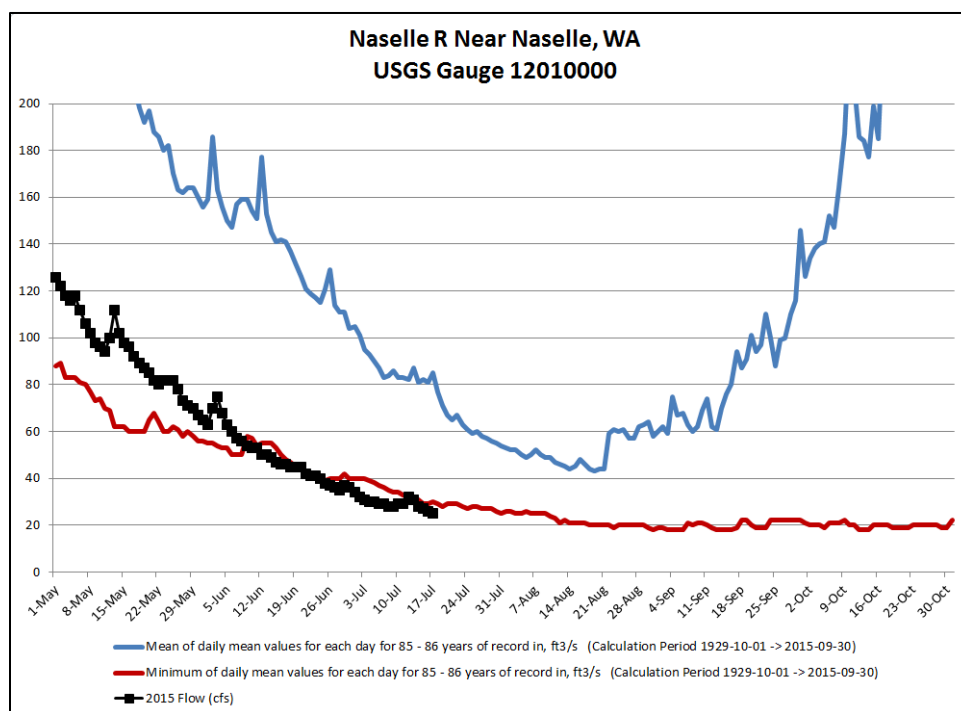




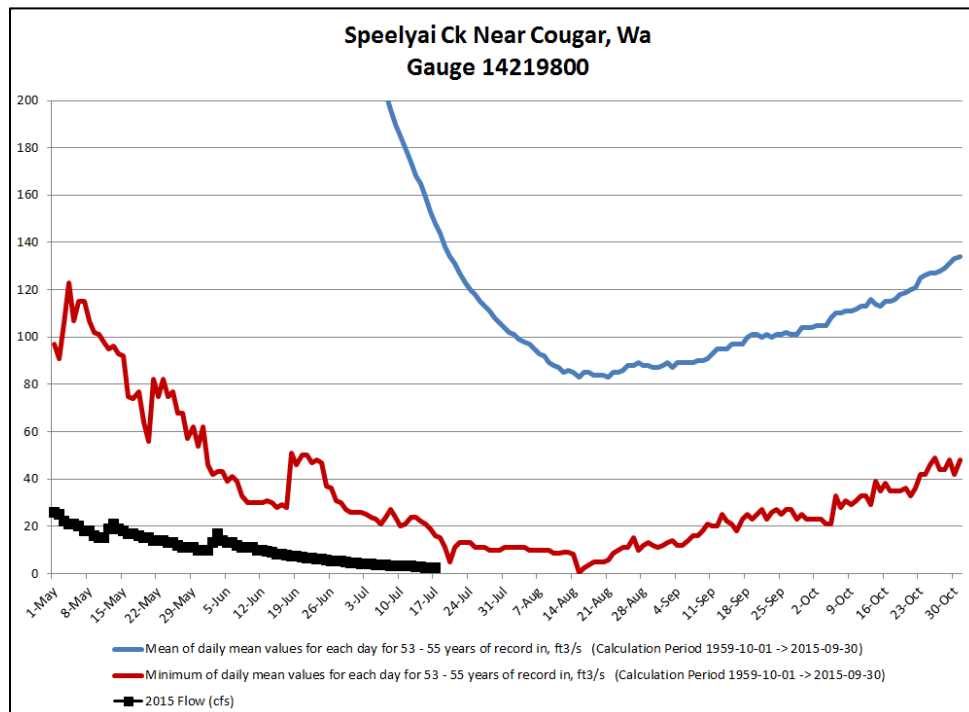
These flows represent inflow to the Skookumchuck Reservoir. Records low flows are obviously even worse than last year.



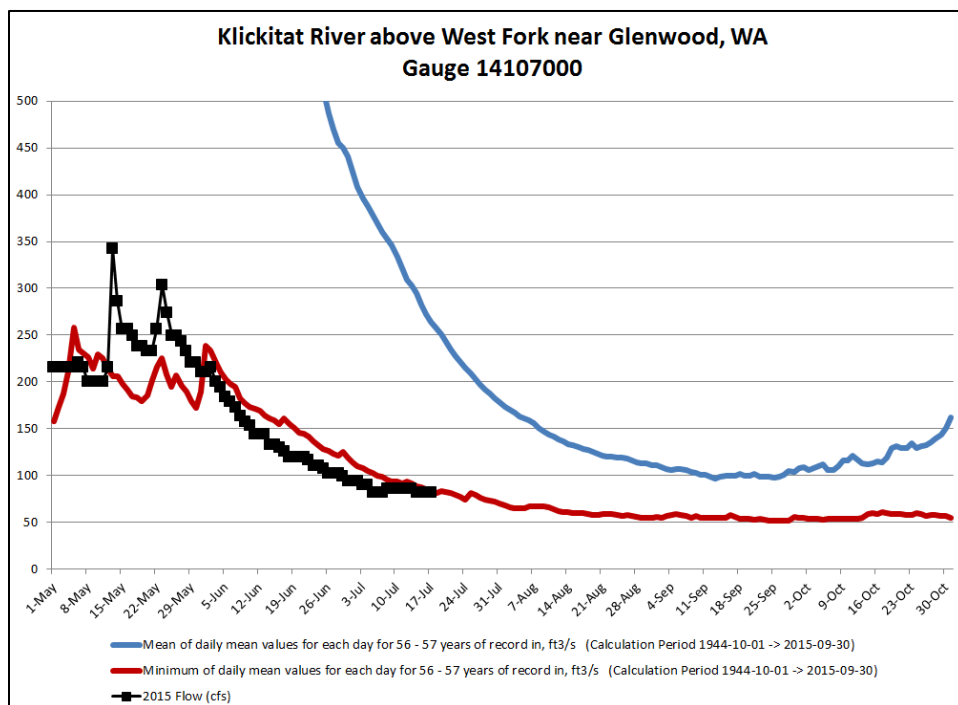
Naselle R shows record low flows. If today's figures represent base flows here that's pretty consistent with the overall one-to-two-months-early we observed earlier this summer.



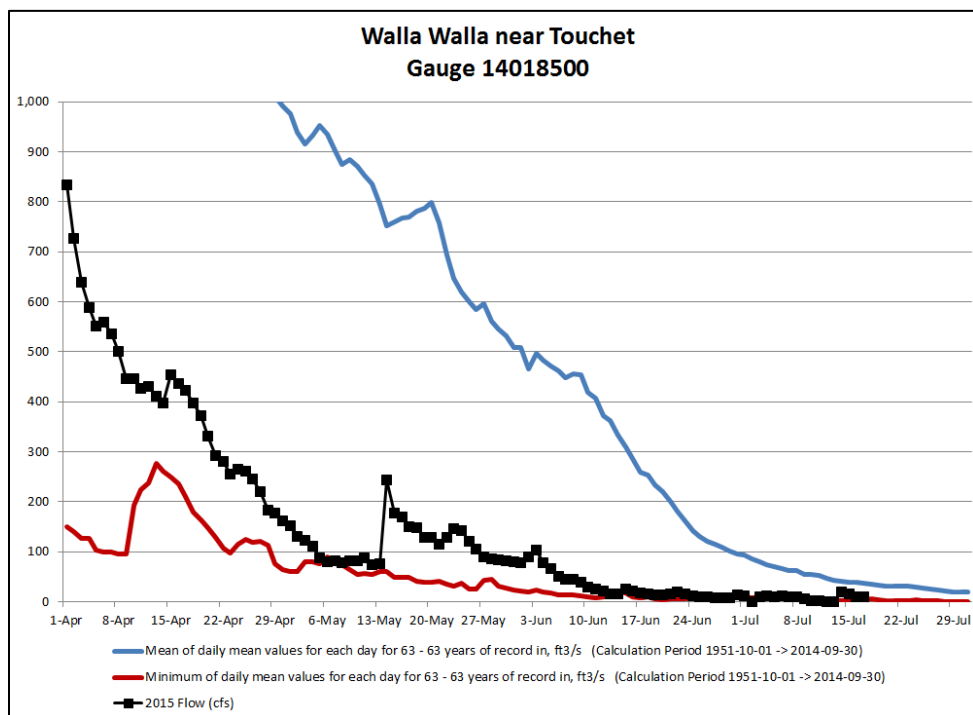
Skeelyai Ck rate of decline is slowing, and total flow is less than 2.6 cfs. It would be great to hear from hatchery folks about this situation!



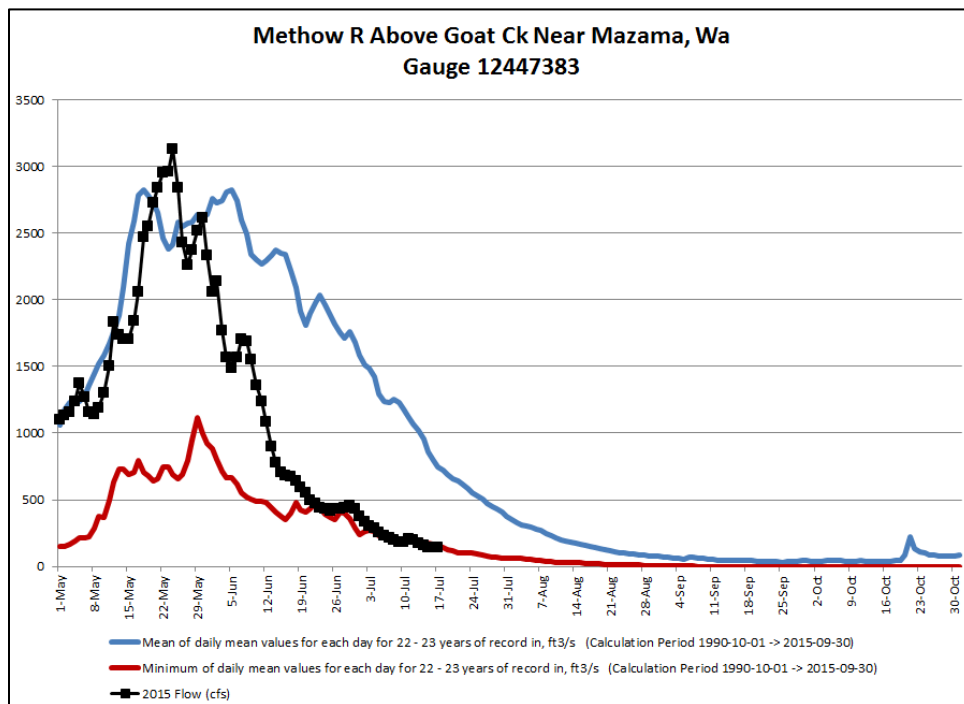
Record low flows, but potentially bottomed out. We'll chalk this one up to the "pessimistic" view (not getting any worse).



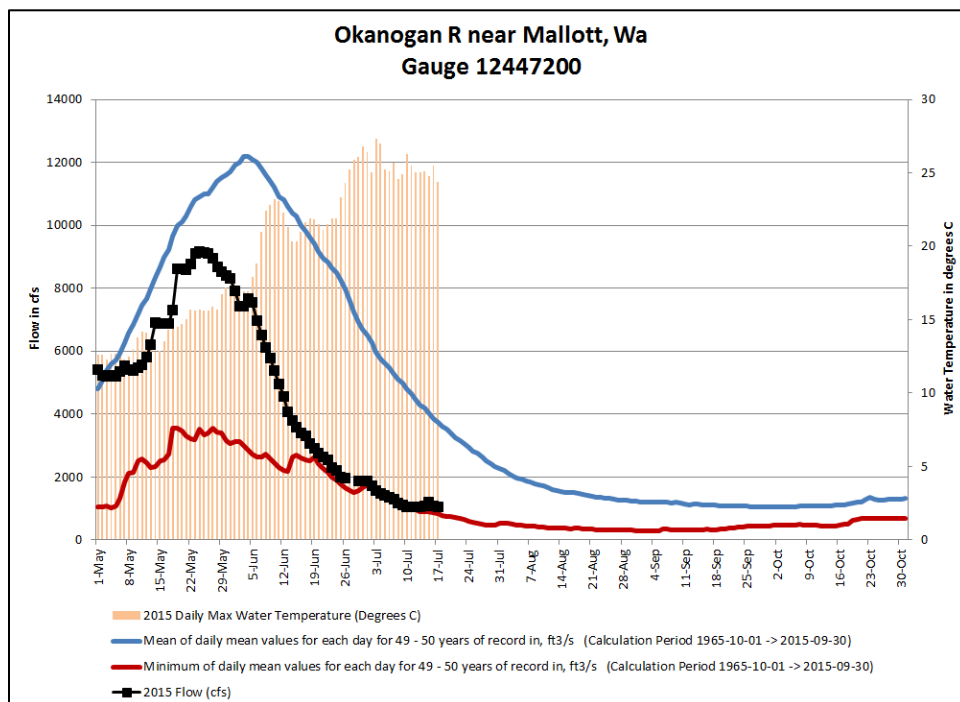
Walla Walla flows are critically low, but maybe not record low.



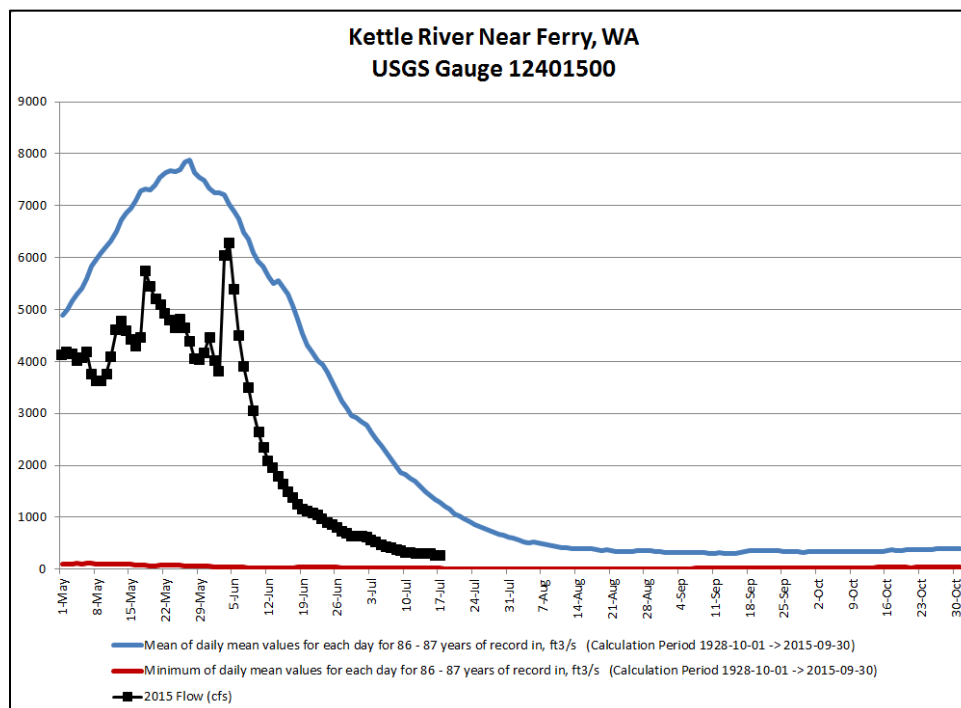
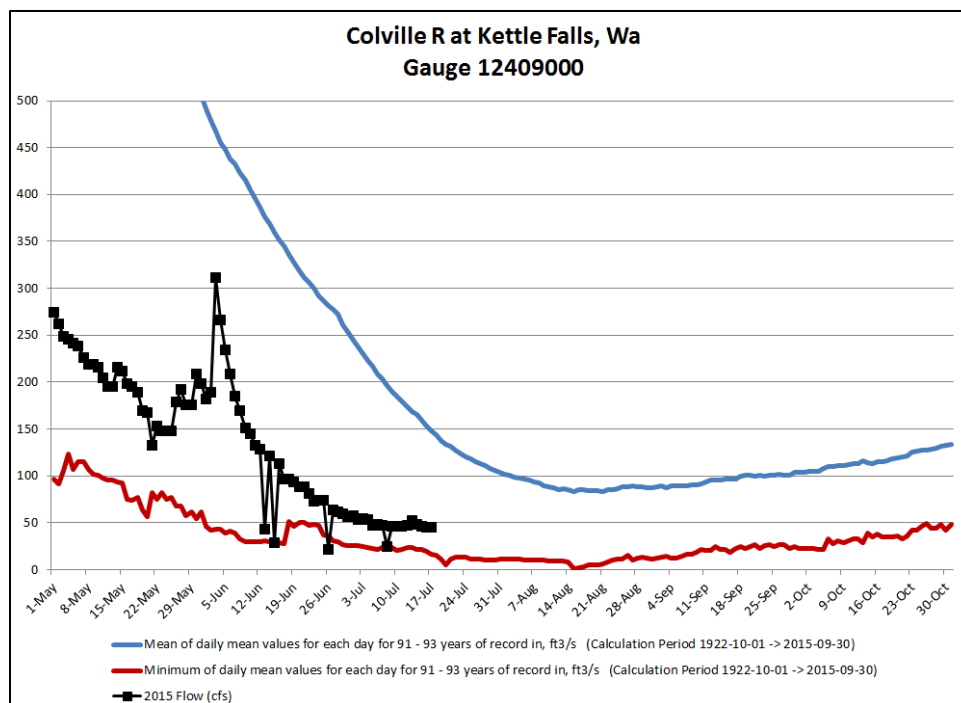
Methow is tracking with its historic low base flows.



Obviously, Okanogan is in a world of hurt. At least flows are staying slightly above record lows, that's good, right?



Colville and Kettle are telling similar overall stories, so the question remaining is, “How low can they go?” I am checking with Ecology’s Eastern Regional Office on these dips in the Colville flows.



Streamwatch links:

Stilly	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12167000
Issaquah	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12121600
Dungeness	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12048000
Hoko	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12043300
Calawah	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12043000

Skookumchuck	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12025700
Naselle	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12010000
Speelyai	http://waterdata.usgs.gov/wa/nwis/uv?site_no=14219800
Klickitat	http://waterdata.usgs.gov/wa/nwis/uv?site_no=14107000
Walla Walla	http://waterdata.usgs.gov/wa/nwis/uv?site_no=14018500
Methow	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12447383
Okanogan	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12447200
Colville	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12409000
Kettle	http://waterdata.usgs.gov/wa/nwis/uv?site_no=12401500

Sorry, Alan, I still didn't get to the Nooksack this week. Soon, I promise.